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ABSTRACT

This instructor's guide contains 18 lessons for teaching advanced dairying in accordance with the Missouri State Board of Education's Vocational Instructional Management System. To make the unit easier for teachers to use, the following materials are provided in the front of the unit: objectives and competencies for each lesson, a references and materials list, and a competency profile. Each of the 18 lessons contains the following components: teaching procedures, information sheets, study questions, evaluation test with answers, references, and transparency masters. The lessons cover the following topics: profitability of the dairy enterprise, production costs for dairy, comparative advantages of dairy, milk secretion, milking and sanitation procedures, dairy record and testing systems, marketing milk, marketing dairy replacements, local, state, and federal regulations for dairy, matching production to marketing, government programs for dairy, dairy associations and organizations, selecting breeding animals, reproductive management, facilities, and equipment, dairy herd health programs, feeding dairy animals, and using pasture and roughage. (KC)

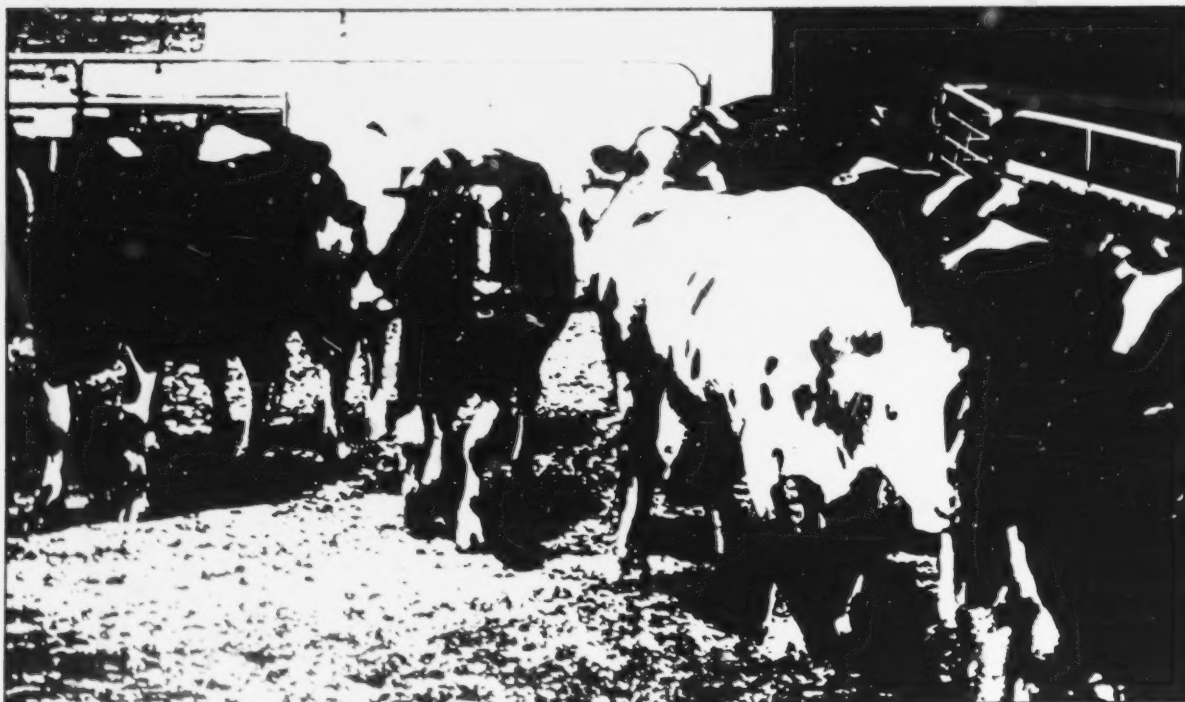
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Advanced Dairy Unit

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for Advanced Livestock Production Curriculum

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Instructor's Guide

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In cooperation with
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ADVANCED DAIRY UNIT

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This Advanced Dairy unit, part of the Advanced Livestock Production curriculum, represents a major revision of the previous guide. Its modification was suggested by the MVATA Teaching Aids Committee.

Special thanks are due to Dairy Advisory Committee members for providing their valuable time and suggestions in developing this unit. The committee consisted of Jim Bellis, Kerry Kephart, Dean Swafford, Eddie Fugate, Leonard McGee, Rex Ricketts and Alan Wessler.

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Special recognition is also given to Harley Schlichting, director, and the staff at the Instructional Materials Laboratory for the typing and illustrating of this unit.

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FOREWORD

This unit replaces the previous dairy unit in the Advanced Livestock Production curriculum. The selected readings which is available with this instructor's guide has been designed to supplement James Gillespie's Modern Livestock and Poultry Production, 2nd ed., as the student reference. In all, 18 lessons have been developed to build on Agricultural Science I and II competencies.

During the summer of 1981, the Missouri State Board of Education formally adopted the concept of "Instructional Management Systems" (IMS) as a priority for the 1981-82 school year. Missouri Commissioner of Education Arthur L. Mallory has described the IMS concept as a practical way of "organizing for excellence" in education. To meet the demand for greater productivity and accountability, Frank Drake, Director of Vocational Education, applied the elements of IMS to form the "Vocational Instructional Management System" (VIMS). The VIMS process provides a framework to use in planning and organizing to assure excellence in Missouri's vocational educational system by focusing greater attention on the management of teaching and learning.

To aid vocational agriculture teachers in the implementation of VIMS, this guide incorporates the needed component parts to meet VIMS requirements. For ease of use, performance objectives and competencies have been included at the beginning of the unit, as well as being incorporated within each lesson. A competency profile has also been provided for convenient recordkeeping.

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ADVANCED DAIRY
TABLE OF CONTENTS

ACKNOWLEDGMENTS	ii
FOREWORD	iii
OBJECTIVES	vii
REFERENCES AND MATERIALS	ix
COMPETENCY PROFILE	xii
 Lesson 1--Profitability of the Dairy Enterprise	 1
TM 1.1: MIR Program: 1985 Dairy-type Farms	9
TM 1.2: Enterprise Profitability	11
 Lesson 2--Production Costs for Dairy	 13
HO 2.1: Dairy Cow Budget	21
HO 2.2: Buying or Leasing Dairy Cows	25
 Lesson 3--Comparative Advantages of Dairy	 27
HO 3.1: Replacement Dairy Heifer Budget	37
 Lesson 4--Milk Secretion	 39
TM 4.1: Parts of the Mammary System	49
 Lesson 5--Milking and Sanitation Procedures	 51
 Lesson 6--Dairy Record and Testing Systems	 61
HO 6.1: DHI Reports	69
 Lesson 7--Marketing Milk	 71
TM 7.1: Somatic Cell Count Effects on Production	79
 Lesson 8--Marketing Dairy Replacements	 81
 Lesson 9--Local, State and Federal Regulations for Dairy	 89
 Lesson 10--Matching Production to Marketing	 97
 Lesson 11--Government Programs for Dairy	 105

TM 11.1: M-W Price Series vs. the Support Price	113
Lesson 12--Dairy Associations and Organizations	115
Lesson 13--Selecting Breeding Animals	123
Lesson 14--Reproductive Management	133
TM 14.1: Ultrasound Testing	141
Lesson 15--Facilities and Equipment	143
TM 15.1: Milking Parlor Designs	157
TM 15.2: Silage Storage Losses	159
Lesson 16--Dairy Herd Health Programs	161
Lesson 17--Feeding Dairy Animals	169
HO 17.1: Analysis Information Sheet	183
Lesson 18--Using Pasture and Roughage	185

ADVANCED LIVESTOCK PRODUCTION

UNIT - ADVANCED DAIRY

LESSONS

1. Profitability of the Dairy Enterprise
2. Production Costs for Dairy
3. Comparative Advantages of Dairy
4. Milk Secretion
5. Milking and Sanitation Procedures
6. Dairy Record and Testing Systems
7. Marketing Milk
8. Marketing Dairy Replacements
9. Local, State and Federal Regulations for Dairy
10. Matching Production to Marketing
11. Government Programs for Dairy
12. Dairy Associations and Organizations
13. Selecting Breeding Animals
14. Reproductive Management
15. Facilities and Equipment
16. Dairy Herd Health Programs
17. Feeding Dairy Animals
18. Using Pasture and Roughage

OBJECTIVES

1. The student will use comparative data to determine the profitability of dairy enterprises in Missouri.
2. The student will calculate production costs for a dairy enterprise.

3. The student will compare labor and capital advantages of a dairy enterprise.
4. The student will describe how feeding and disease control relate to the process of milk secretion.
5. The student will describe milking and sanitation procedures that will assure quality milk.
6. Using pedigrees and DHI records, the student will be able to select superior breeding stock.
7. The student will evaluate different milk marketing systems.
8. The student will evaluate marketing options for dairy replacements.
9. The student will describe local, state and federal regulations as they apply to the production of Grade A raw milk.
10. The student will design a plan of production practices to match marketing strategies.
11. The student will describe how government programs affect the dairy industry.
12. The student will identify and describe the different dairy breed associations and producer organizations.
13. The student will select breeding animals that will increase the productivity of the dairy herd.
14. The student will design a reproductive management program.
15. The student will plan the appropriate facilities and equipment for a dairy operation.
16. The student will design a herd health program.
17. The student will evaluate feedstuffs and use the information to develop cost-effective, well-balanced dairy rations.
18. The student will plan a forage program for profitable milk production on a dairy farm.

NOTE: Percent of accuracy should be set by instructors to reflect passing grade within their school system.

COMPETENCIES

1. Determine the profitability of a dairy enterprise.
2. Calculate the cost of production for a dairy enterprise.
3. Evaluate the comparative advantages (labor vs. capital) of the dairy enterprise.
4. Describe the process of milk secretion.
5. Describe milking and sanitation procedures that will assure quality milk.
6. Evaluate the different dairy record and testing systems available.
7. Plan a profitable milk marketing system.
8. Develop a marketing system for replacement animals.
9. Identify local, state and federal regulations as they apply to dairy production.
10. Select production practices to match marketing strategies.
11. Describe government programs and how they affect the dairy industry.
12. Identify the different dairy associations and organizations.
13. Select breeding animals that will increase the productivity of the dairy herd.
14. Describe reproductive technology for dairy.
15. Analyze the farm situation and select the appropriate facilities and equipment for milk production.
16. Plan a herd health program.
17. Evaluate feedstuffs for the most profitable balanced ration.
18. Plan a pasture and roughage program for profitable milk production.

MOTIVATIONAL TECHNIQUE

1. Project the cost and profit potential for the dairy industry in the decade to come. How will this potential affect local and national farm income?

2. Relate today's dairy industry with dairy production in the year 2000. Discuss technological advances which may cause production to change. Look at how government programs will change the industry.
3. Compare the dairy industry with other livestock segments of agriculture: beef, sheep, swine and poultry. Discuss how labor, capital and management needs differ.

EVALUATION

1. Give short, objective tests following each lesson and a more in-depth objective test at the conclusion of the unit.
2. Observe the changes in behavior as evidence of an improved ability of students to deal with problems in this unit using background acquired from earlier units.
3. Observe students' attempts to solve similar problems in their supervised occupational experience programs.

REFERENCES AND MATERIALS

1. Student references

- a) Gillespie, James R. Modern Livestock and Poultry Production, 2nd ed. Albany, NY: Delmar, 1983.
- b) Advanced Dairy (Selected Readings)

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2. Teacher references

NOTE: The numbers in parentheses following these entries indicate lessons that may be supplemented by the material.

- a) Baker and Greer. Animal Health - A Layman's Guide to Disease Control. Danville, Ill.: Interstate, 1980. (3, 4)
- b) Barnes, Robert F.; Maurice E. Heath; Darrel S. Metcalfe; eds. Forages: The Science of Grassland Agriculture, 4th ed. Ames: Iowa State University Press, 1985. (18)
- c) Bath, Donald L., et. al. Dairy Cattle: Principles, Practices, Problems, Profits, 2nd ed. Philadelphia: Lea & Febiger, 1978. (16)

- d) Bundy, Diggins and Christensen. Dairy Production. 4th ed. Englewood Cliffs, N.J.: Prentice, 1979. (2, 8)
- e) Campbell, John R.; Robert T. Marshall. The Science of Providing Milk for Man. N.Y.: McGraw-Hill, 1975. (5, 7, 10, 13, 16)
- f) Cullison, Arthur E. Feeds and Feeding. Reston, Va.: Reston Publishing Co., Inc., 1975. (17)
- g) Ensminger, M. E. Dairy Cattle Science, 2nd ed. Danville: Interstate, 1980. (2-4, 7, 11, 14-18)
- h) Kaiser, Harry M., ed. Proceedings of the Cornell Conference on Mandatory Supply Management Programs for the Dairy Industry. Ithaca, N.Y.: New York State College of Agriculture and Life Sciences, Cornell University, 1987. (11)
- i) Quinn, Thomas. Dairy Farm Management. Albany: Delmar, 1980. (2, 6, 9, 15-18)
- j) Dairy Housing and Equipment Handbook (MWPS-7), 4th ed. Ames: Midwest Plan Service, Iowa State University, 1985. (15)
- k) Dairy: Background for 1985 Farm Legislation (Agriculture Information Bulletin No. 474). Washington, D.C.: Economic Research Service, USDA, 1984. (11)
- l) Instructional Materials Laboratory materials
 - 1) Dairy Cattle Judging Handbook (AG-1101-S). College Station, Texas: Vocational Instructional Services, Texas A&M University.
 - 2) "Dairy Cattle Judging" slides (AG-1102-V). Stephenville, Texas: Tarleton State University, 1984.
 - 3) Techniques of Judging Dairy Cattle (AG-85-S) by Dennis A. Hartman, Blacksburg, Va., 1979.
- m) University of Missouri-Columbia Extension Division agricultural publications*
 - 1) FM8690: Missouri Farm Business Summary (1985)
 - 2) G430: Buy or Lease Dairy Cows (1985)
 - 3) G3006: Dairy Herd Breeding Program (1979)
 - 4) G3011: Reproductive Dairy Herd Health Program--Routine Examinations (1975)
 - 5) G3012: Detecting Heat in Dairy Cows (1975)
 - 6) G3150: Forages for Cattle (1986)
 - 7) G3151: Using a Microwave Oven to Determine Moisture in Forages (1986)
 - 8) G3300: Mastitis (1974)

- 9) G3305: Somatic Cell Count (1981)
- 10) G3451: Calf Hutches (1972)
- 11) G3555: Raising Calves on Stored Colostrum (1976)
- 12) G3556: Raising Dairy Replacements (1985)
- 13) G3561: Good Milking Procedures (1984)
- 14) G3650: Practice Good Milking for More Profit (1968)
- 15) G3651: Cleaning and Sanitizing Milking Equipment (1975)
- 16) G3653: Using the California Mastitis Test (1986)
- 17) G3700: The Components of Milk--Variation; Measurement; Value (1964)
- 18) G3805: Milk Protein and Factors Affecting Variation (1985)
- 19) G9650: Sampling Feedstuff for Chemical Analysis (1976)
- 20) M75: Missouri Farm Planning Handbook (Manual 75) (1983, revised 1986)

n) Periodicals

- 1) Bennett, Myron. "1985 Dairy Enterprise Business Earnings and Costs," Farm Management Newsletter. Columbia: UMC Extension Division, August 29, 1986.
- 2) "Milk for Manufacturing Purposes and its Production and Processing," Recommended Requirements, Federal Register. Washington, D.C.: Consumer and Marketing Service, U.S. Dept. of Agriculture. Vol. 37, no. 68 (April 7, 1972).
- 3) Missouri Dairy News. Columbia, Mo.: Missouri Dairy Asso., Missouri Dairy Herd Improvement Federation and UMC Dairy Science Dept. Vol. 1, no. 4 (December 1986).

o) Pamphlets

- 1) 1986 Dairy Producer Highlights. Arlington, Va.: National Milk Producers Federation.
- 2) "Grade A Pasteurized Milk Ordinance: 1978 Recommendations." Public Health Service; FDA; U.S. Dept. of Health, Education and Welfare.
- 3) "Grade A Pasteurized Milk Regulations." Jefferson City, Mo.: State Milk Board, Missouri Dept. of Agriculture, 1980.

- 4) Guide to Using DHI Reports. Ames, Iowa: Mid-States Dairy Records Processing Center, Iowa State University.
- (a) "An Introduction to Dairy Herd Improvement Records"
 - (b) "How to Interpret the Sample Day and Lactation Report (DHIA-200)"
 - (c) "How to Interpret the Herd Summary (DHIA-202)"

*Available from Extension Publications, 115 S. 5th St., Columbia, MO 65211.

Directions: Evaluate the student by checking the appropriate number or letter to indicate the degree of competency. The rating for each task should reflect **employability readiness** rather than the grades given in class.

Rating Scale: 3 **Mastered** - can work independently with no supervision
2 **Requires Supervision** - can perform job completely with limited supervision
1 **Not Mastered** - requires instruction and close supervision
N **No Exposure** - no experience or knowledge in this area

[illegible]

Advanced Dairy

1. Determine the profitability of a dairy enterprise.
2. Calculate the cost of production for a dairy enterprise.
3. Evaluate the comparative advantages (labor vs. capital) of the dairy enterprise.
4. Describe the process of milk secretion.
5. Describe milking and sanitation procedures that will assure quality milk.
6. Evaluate the different dairy record and testing systems available.
7. Plan a profitable milk marketing system.
8. Develop a marketing system for replacement animals.
9. Identify local, state and federal regulations as they apply to dairy production.
10. Select production practices to match marketing strategies.
11. Describe government programs and how they affect the dairy industry.
12. Identify the different dairy associations and organizations.
13. Select breeding animals that will increase the productivity of the dairy herd.
14. Describe reproductive technology for dairy.
15. Analyze the farm situation and select the appropriate facilities and equipment for milk production.
16. Plan a herd health program.
17. Evaluate feedstuffs for the most profitable balanced ration.
18. Plan a pasture and roughage program for profitable milk production.

Advanced Dairy

CLASS/SECTION: _____

STUDENTS:

	Determine the profitability of a dairy enterprise.
	Calculate the cost of production for a dairy enterprise.
	Evaluate the comparative advantages (labor vs. capital) of the dairy enterprise.
	Describe the process of milk secretion.
	Describe milking and sanitation procedures that will assure quality milk.
	Evaluate the different dairy record and testing systems
	Plan a profitable milk marketing system
	Develop a marketing system for replacement animals.
	Identify local, state and federal regulations as they apply to dairy production.
	Select production practices to match marketing strategies.
	Describe government programs and how they affect the dairy industry.
	Identify the different dairy associations and organizations
	Select breeding animals that will increase the productivity of the dairy herd.
	Describe reproductive technology for dairy.
	Analyze the farm situation and select the appropriate facilities and equipment for milk production.
	Plan a herd health program.
	Evaluate feedstuffs for the most profitable balanced ration.
	Plan a pasture and roughage program for profitable milk production.

UNIT - ADVANCED DAIRY

Lesson 1: Profitability of the Dairy Enterprise

Objective: The student will use comparative data to determine the profitability of dairy enterprises in Missouri.

Study Questions

1. What advantages does Missouri have as a dairy state?
2. What are the major factors to consider before entering dairy production?
3. How does dairy profitability compare to other livestock enterprises?

References

1. Gillespie, James R. Modern Livestock and Poultry Production, 2nd ed. Albany, NY: Delmar, 1983.
2. Advanced Dairy (Selected Readings). University of Missouri-Columbia: Instructional Materials Laboratory, 1987.
3. Transparency Masters
 - a) TM 1.1: MIR Program: 1985 Dairy-type Farms
 - b) TM 1.2: Enterprise Profitability

UNIT - ADVANCED DAIRY

Lesson 1: Profitability of the Dairy Enterprise

TEACHING PROCEDURES

A. Introduction

B. Motivation

Competition is becoming more severe with agriculture's excess capacity to produce. Producers in a more competitive position are earning above-average profits from their businesses. Use the 1985 MIR table on TM 1.1 to illustrate the profit-earning capability of competitive dairies in Missouri. Efficient management and cost control are helping Missouri dairy producers to become more profitable.

C. Assignment

D. Supervised study

E. Discussion

1. Missouri ranks in the top 10 in at least nine categories measured by the U.S. Statistical Reporting Service. Refer the students to the selected readings, and with their input, list some of the advantages of operating a dairy enterprise in the local area.

What advantages does Missouri have as a dairy state?

- a) Missouri ranks first among eight surrounding states with an average of 12,371 pounds of milk produced yearly per cow.
- b) Missouri has an excellent location for marketing milk.
 - 1) The highest usage areas of fluid milk in the U.S. are in the South and Southeast.
 - (a) Fluid milk reaps the highest price per cwt because of perishability and demand.
 - (b) Population centers in southern states cause increased milk consumption and importation.
 - 2) Missouri's location allows dairy farmers to take advantage of southern markets.
- c) Missouri has the land, soil and management potential for producing quality forage.
- d) Equipment and milk-hauling costs are kept low as long as there remains a critical core of dairy producers throughout the state.
- e) Missouri's climate is conducive to good animal performance.
 - 1) Very supportive of good plant growth as well as animal performance
 - 2) Allows utilization of pasture programs and reduces costs in raising heifers and keeping dry cows

- f) Missouri's land prices and taxes are much lower than many other states'.
 - g) Missouri is in one of the best locations in the U.S. for alternative feeds.
 - 1) Since 50-60% of the cost of milk production stems from feed costs, inexpensive alternative feeds are essential to efficient production.
 - 2) Missouri is at the southern edge of the major corn and soybean production areas for corn gluten feed and soy hulls.
 - 3) The brewery industry in eastern Missouri provides wet and dry brewer's grains.
 - 4) Cotton and rice industries in the southeast provide cottonseed feed and rice bran.
 - 5) The wheat industry in western Missouri provides wheat midds.
 - 6) Distilling industries located throughout the state produce distiller's grains.
 - h) Missouri is well represented by major milk marketing organizations.
 - i) The high-quality extension and educational systems in Missouri have helped make it an excellent state for dairy.
2. Contrast working in dairy production to other agricultural enterprises. How do levels of management expertise, labor, time demands, start-up costs and capital turnover time differ among the various agricultural enterprises? What are some characteristics of a successful dairy operation?

What are the major factors to consider before entering dairy production?

- a) Some positive factors to consider
 - 1) A lactating cow's diet generally consists of 50% forages, and Missouri is strong in forage production.
 - 2) Dairying provides a steady income throughout the year.
 - 3) Labor is used throughout the year.
 - 4) Death losses in the dairy herd are usually low if good management is followed.
 - b) Some negative factors to consider
 - 1) A high capital investment is required.
 - 2) The labor requirement is high, and the operator is confined to a regular schedule of milking.
 - 3) Training and experience are needed before entering into the dairy business.
 - 4) It takes a relatively long time to develop a high-producing dairy herd.
3. Use TM 1.2 in discussing dairy profitability with the students.
 NOTE: The following data is based on results of University of Missouri studies (Farm Business Management Analysis for 1981-85 and 1985 Mail-In-Record {MIR} Program). These results cannot be

considered representative of an average Missouri farm because participation in the program is voluntary. However, it is felt the results show what can reasonably be expected on commercial farms in Missouri.

How does dairy profitability compare to other livestock enterprises?

- a) According to FBMA summary records for 1981-1985, participating dairy farms had greater net farm incomes than hog or beef farms every year.
- b) Missouri MIR statistics showed that dairy farms were more profitable than the average of all farms for two of the five years.
 - 1) From 1976-1985, dairy farms had a higher return to land, labor, capital and management than hog enterprises for five of 10 years.
 - 2) Compared to swine enterprises, dairies had a higher percent return to management during six of 10 years.
 - 3) Compared to beef enterprises, dairies showed a higher percent return to management during nine of 10 years.

F. Other activities

- 1. Assign readings concerned with dairy production in the Missouri Farm Business Summary (FM8690).
- 2. Invite a county extension agent to explain how dairy farmers can get involved in the University of Missouri MIR Program.
- 3. If the vocational agriculture program currently has an FBMA class, the instructor should explain this recordkeeping system and encourage participation.

G. Conclusion

Some dairy farms in Missouri are both competitive and profitable. Two ways Missouri dairy producers can add to their profitability is through efficiency in production and accurate recordkeeping. Opportunities exist throughout the state for dairying to become an increasingly important agricultural enterprise in Missouri.

H. Competency

Determine the profitability of a dairy enterprise.

I. Answers to Evaluation

- 1. 50%
- 2. Alternative
- 3. Conducive
- 4. Lower

- 5. Southern
- 6. Low
- 7. b
- 8. d

- 9. Answers should include four of the following:
 - a) Dairy cattle use roughages for feed.
 - b) Dairying provides a steady income throughout the year.
 - c) Labor is used throughout the year.
 - d) Death losses in the herd are usually low.
 - e) A high capital investment is required.
 - f) The labor requirements are high and milking schedules regular.
 - g) Training and experience are needed.
 - h) It takes a long time to develop a high-producing dairy herd.
- 10. Area dairy specialists and specialists in related areas (forages, crops, etc.) working with extension specialists provide information concerning dairy science research results and management practices to dairy producers throughout the state.

Name _____

UNIT - ADVANCED DAIRY

Date _____

Lesson 1: Profitability of the Dairy Enterprise

EVALUATION

Complete the following statements by circling the appropriate word or letter.

1. A lactating cow's diet generally consists of (20%/50%) forages.
2. Missouri is in one of the best locations in the U.S. for (traditional/-alternative) dairy feeds.
3. Missouri's climate is (detrimental/conducive) to good animal performance.
4. Missouri's land prices are (higher/lower) than many other states'.
5. Missouri's location allows dairy farmers to take advantage of (southern/western) milk markets.
6. As there remains a critical core of dairy producers throughout the state, costs of hauling milk and equipment are kept (low/high).
7. From 1976-1985, the enterprise with the highest percent return to management has most often been _____.
 - a. Beef
 - b. Dairy
 - c. Swine
 - d. Sheep
8. According to 1981-85 FBMA records, dairy net farm income exceeded hog or beef production during _____ years.
 - a. One
 - b. Two
 - c. Three
 - d. Five

9. List four important factors to consider before entering dairy production.
 - a.
 - b.
 - c.
 - d.
10. Explain how the extension and educational systems in Missouri have helped improve dairy production throughout the state.

MIR* Program: 1985 Dairy-Type Farms

	Level of Earnings	
	Average	High
Number of farms	29	15
Average number of cows	78	86
Average pounds of milk per cow	13,596	14,794
Gross milk price received per cwt	\$ 12.71	\$ 12.47
Net farm price received per cwt	13.18	12.79
Business data		
% return to capital	2.0	7.0
Average capital managed	\$485,439.00	\$544,324.00
Net profit	7,998.00	33,581.00
Average interest paid	15,445.00	17,293.00

*Mail-in-Record Program

Note: Twenty-nine dairy-type farms were ranked according to their business earnings (percent return to capital). The above table lists the averages of all 29 dairy farms and averages of the 15 high-earning farms.

Credit: Missouri Dairy News, Columbia, Mo: Dairy Asso., Mo. Dairy Herd Improvement Federation and UMC Dairy Science Dept. vol. 1, no. 4, December 1986.

Enterprise Profitability

Return to Land, Operators' and Owners' Labor, Capital and Management

	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	Avg'76-85
All Farms	\$36,415	\$49,592	\$80,425	\$81,779	\$52,998	\$37,512	\$57,875	\$44,776	\$28,016	\$57,946	\$52,733
Crop	55,366	62,095	95,962	111,534	78,419	49,397	59,309	75,382	28,378	79,460	69,530
II Dual Crop-Hog	31,977	52,700	93,963	58,264	32,278	20,424	68,991	40,770	25,049	58,497	48,291
Hog	23,655	55,749	91,160	28,249	25,906	17,757	94,373	13,036	49,747	41,709	44,134
Major/Minor Crop-Beef	32,139	40,059	73,990	95,234	33,346	9,807	28,035	46,630	1,971	32,766	39,398
Major/Minor Crop-Hog	37,382	53,723	73,585	81,784	61,020	50,349	63,921	42,366	17,154	67,451	54,874
Dairy	26,136	31,421	47,372	48,154	40,426	44,990	40,410	16,409	29,510	24,836	34,966
Major/Minor Hog-Crop	\$29,372	\$40,573	\$67,666	\$44,950	\$36,037	\$10,856	\$79,174	\$15,397	\$40,818	\$70,670	\$43,551

Credit: Missouri Farm Business Summary (FM 8690). University of Missouri-Columbia: Extension Division, 1985.

UNIT - ADVANCED DAIRY

Lesson 2: Production Costs for Dairy

Objective: The student will calculate production costs for a dairy enterprise.

Study Questions

1. What are the major costs involved in production?
2. What is the income potential of Grade A vs. manufacturing-grade milk?
3. How does leasing compare to ownership in a dairy enterprise?
4. What are the costs in maintaining herd health?

References

1. Gillespie, James R. Modern Livestock and Poultry Production, 2nd ed. Albany, NY: Delmar, 1983.
2. Advanced Dairy (Selected Readings). University of Missouri-Columbia: Instructional Materials Laboratory, 1987.
3. Handouts
 - a) HO 2.1: Dairy Cow Budget
 - b) HO 2.2: Buying or Leasing Dairy Cows

UNIT - ADVANCED DAIRY

Lesson 2: Production Costs for Dairy

TEACHING PROCEDURES

A. Review

Review the previous lesson.

B. Motivation

Provide each student with a fresh, chilled pint of milk. While drinking milk with the students, develop a dairy production cost list. Start with the pint of milk at the bottom and progress up the list to where the students decide production begins. Ask which local production costs are of greatest concern. How are successful dairy managers meeting these costs?

C. Assignment

D. Supervised study

E. Discussion

1. Rank with the students the top five dairy production costs for the area. Then refer them to HO 2.1 for actual production figures.

What are the major costs involved in production?

- a) Major costs
 - 1) Feed
 - (a) Grain
 - (b) Hay or haylage
 - (c) Silage and green chop
 - (d) Pasture
 - 2) Labor
 - (a) Operator
 - (b) Family
 - (c) Hired help
- b) Other operating or variable costs
 - 1) Machinery and equipment
 - (a) Purchase
 - (b) Repair
 - (c) Hire
 - 2) Veterinary care and medicine
 - 3) Livestock supplies and hauling
 - 4) Utilities
 - 5) Insurance
 - 6) Property and sales taxes
 - 7) Repairs

- 8) Operating interest
- c) Overhead or fixed costs
 - 1) Real estate, depreciation and interest on buildings
 - 2) Interest on cow herd
 - 3) Interest and depreciation on machinery and equipment
- 2. Collect 5-10 dairy product containers--two containers of each product, if possible. Coat one container of each pair with white paint and use a handwritten masking tape label to identify the contents previously held within. First, show the painted containers to the students. Demonstrate the importance of the Grade A label, as well as other quality information, by asking the students if they would purchase dairy products sold in plain white containers.

What is the income potential of Grade A vs. manufacturing-grade milk?

- a) Milk retailer observations
 - 1) Increased quality stimulates consumption.
 - 2) Consumers are willing to pay higher prices for milk of high quality.
- b) Demand for milk of superior quality
 - 1) Processors and dairies are paying producers premium prices for high-quality milk.
 - 2) Some cases show prices as high as \$2 per hundred-weight.
- c) Added income from the sale of high-quality milk from a 40-cow herd producing an average of 10,000 lbs. of milk can be \$7,000-\$8,000 yearly.
- 3. Give HO 2.2 to the students and work through an example of estimating a budget to acquire a dairy cow by leasing as compared to a cash purchase. Make the example realistic by obtaining and using the leasing terms of a local dairy cow lessor.

How does leasing compare to ownership in a dairy enterprise?

- a) Dairy farmers may have limited available capital.
- b) Dairy farmers may be limited on the amount of capital they can borrow.
- c) Leasing is a method of using additional capital without disturbing present sources of credit.
- d) Leasing has distinct benefits to farmers.
 - 1) Increase their number of cows to make greater use of available labor, management and facilities
 - 2) Possibly acquire higher-producing cows than present source of credit might allow
 - 3) Receive services and advice from cow-leasing firms
- e) Leasing agreement standards are agreed upon.
 - 1) The dairy farmer acquires the use of a dairy cow by

making periodic payments to the person or firm granting the lease.

- 2) Ownership rights of the cow remain with the lessor.
- 3) The lessee has possession and the right to all milk receipts.

4. Ask the students with dairy experience to describe health problems they have observed in a herd. What costs that go into a dairy operation are important in maintaining herd health? Maintaining herd health depends on proper care and feeding, good management and sanitation, as well as a properly planned program of dairy cattle disease prevention and parasite control. NOTE: For more current MIR summaries, contact the Agricultural Economics Department at the University of Missouri-Columbia.

What are the costs in maintaining herd health?

- a) MIR averages of 1981-85 shows the following cost results.
 - 1) Veterinary and medicine costs to produce 100 pounds milk equivalent (percent of variable cost by farm type)
 - (a) Farms where dairy is the major enterprise: 2.1%
 - (b) All farms where dairy production occurs
 - (1) Fewer than 50 cows: 2.3%
 - (2) 50-70 cows: 2.1%
 - (3) More than 70 cows: 2%
 - 2) Veterinary and medicine costs to produce 100 pounds M.E. (percent of variable costs by milk produced per cow)
 - (a) 10,000-12,000 pounds: 1.7%
 - (b) 12,000-14,000 pounds: 2%
 - (c) More than 14,000 pounds: 2.5%
 - 3) Veterinary and medicine costs per mature cow
 - (a) Average of all herds: \$39.40
 - (b) Cows producing 10,000-12,000 pounds of milk: \$27.80
 - (c) Cows producing 12,000-14,000 pounds of milk: \$36.80
 - (d) Cows producing more than 14,000 pounds of milk: \$54.40
- b) Dairy producers need to be aware of practices which help prevent and control disease.
 - 1) Provide good care for the dairy herd.
 - 2) Provide adequate shelter.
 - 3) Feed animals a proper ration.
 - 4) Purchase only disease-free stock.
 - 5) Remove diseased animals from the herd.
 - 6) Guard against carriers of disease.
 - 7) Select breeding stock that is resistant to disease.
 - 8) Plan a good vaccination program.
 - 9) Plan an adequate disease-testing program.

- 10) Plan a routine parasite control program.
- 11) Keep dairy facilities and equipment clean.

F. Other activities

1. Have the students develop an in-class bulletin board of dairy product labels and containers.
2. Invite a dairy cattle lessor to simulate the making of a leasing agreement with the students.

G. Conclusion

Production costs on a dairy farm range from paying for the seed needed to replant pastures to the cost of labor required to put up hay for the winter; from the taxes paid on a cattle leasing plan to the purchase of gasoline for vehicles moving cows to slaughter; and from the cost of vaccinating for brucellosis to the disinfectant it takes to keep the dairy barn floor clean.

H. Competency

Calculate the cost of production for a dairy enterprise.

I. Answers to Evaluation

1. d
2. b
3. b
4. increase
5. lessor
6. lessee
7. Answer should include two of the following:
 - a) Increased milk quality stimulates consumption.
 - b) Consumers are willing to pay higher prices for milk of high quality.
 - c) Processors and dairies are paying producers premium prices for high-quality milk.

UNIT - ADVANCED DAIRY

Name _____

Date _____

Lesson 2: Production Costs for Dairy

EVALUATION

Circle the letter of the best answer.

1. Which of the following represent the major costs in dairy production?
 - a. Labor, machinery and equipment
 - b. Utilities and labor
 - c. Machinery, feed and utilities
 - d. feed and labor
2. MIR results during a recent five-year summary show that the cost of veterinary care and medicine is ____% of the total variable cost required to produce 100 pounds of milk.
 - a. 1.5%
 - b. 2.1%
 - c. 2.8%
 - d. 3.5%
3. On the average for all herds, the cost per cow for veterinary care and medicine, according to a five-year average of MIR results, is _____.
 - a. \$35
 - b. \$40
 - c. \$50
 - d. \$60

Circle the word or letter which best completes the statements.

4. Leasing enables farmers to (increase, decrease) their number of cows to make greater use of available resources.
5. Ownership rights in a dairy cow lease are held by the (lessor, lessee).
6. Possession and the right to all milk receipts are held by the (lessee, lessor).
7. List two reasons why Grade A milk has greater income potential than manufacturing-grade milk.
 - a.
 - b.

Dairy Cow Budget (12,500 lbs. milk, fluid market)

Description of Production: 12,500 pounds milk or 437 pounds butterfat sold per year. 30% of cows replaced per year with raised replacements. Average cow weight 1,200 pounds. 2% cow death loss per year. 85% calving rate every 12 months. 10% calves die before sold or weaned. Sell all bull calves early. Keep all heifers, sell any surplus at 500-700 pounds. If keep dairy steers, add appropriate budget.

		MY FARM
1. Details of gross receipts:		
Milk @ \$11.50/cwt. gross price	125 x \$11.50/cwt.	\$1,438
Share of cull cow	1,200 x 98% x 30% x 37c	131
Young stock, ¹ bull calf	.38 x \$65	25
heifer calf	.08 x 500 lbs. x 48c	19
2. GROSS RECEIPTS PER COW		\$1,613
3. Feed (includes waste):		
Cow: Grain concentrate, \$7.25/cwt. ²	5,200 lbs. (70-88 bu. corn) ³	\$ 377
Forage: ⁷		
Hay, \$65/T.	4.8 T. alfalfa hay	312
Pasture, \$7/AUM	2 AUM	14
Replacement share:		
Starter & grain, \$11/cwt.	950 lbs.	105
Hay, \$50/T.	1.5 T. mixed & grass hay	75
Pasture, \$7/AUM	4 AUM	28
4. TOTAL FEED COSTS		\$ 911
5. Machinery operating costs, feed preparation, etc.		\$ 65
6. Veterinary & medicine		42
7. Other livestock materials & services ⁴		165
8. Utilities		45
9. Other ⁶		--
10. Operating interest ⁵		34
11. TOTAL OTHER VARIABLE COSTS (add Lines 5 through 10)		\$ 351
12. TOTAL ALL VARIABLE COSTS (Line 4 + Line 11)		\$1,262
13. INCOME OVER VARIABLE COSTS ⁶ (Line 2 minus Line 12)		\$ 351
14. Labor hours		55 hrs.
15. Breeding herd investment	\$800 cow, \$150 replacement share	\$ 950

*related footnotes follow this page.

FOOTNOTES FOR DAIRY BUDGETS:

- ¹ For young stock needs and sales per dairy cow, assume:
85% calving rate every 12 months.
Half of calves born are heifers.
10% of all calves born, die before sold.
Sell all bull calves within 14 days.
Keep all heifers, wean, grow out, breed, and any surplus will be sold weighing 500 lbs.

Example: For each cow in herd each year:

1 cow = .85 calf x 10% loss = .085 or .09 loss.
.85 minus .09 = .76 live calf each year (.38 are heifers, .38 are bull calves).
At 30% culling rate, will need .30 heifer per year for replacement.
Raising .38 heifer; then .38 minus .30 = .08 heifer to sell.
Young stock sales per cow per year would be:
.38 bull calves x \$60 = \$23.00
.08 heifer x 500 lbs. x 48¢ = 19.00
\$42.00

- ² Corn at \$2.55 per bu. (\$2.35 + \$.20 storage/bu.) and SBOM at \$7.50/cwt. plus \$2.25/cwt. for minerals, vitamins, grinding, and mixing.

- ³ The crude protein level of concentrates can be 12-14% when alfalfa hay testing 18-22% crude protein is fed. When both corn silage and alfalfa hay are fed, a 16% crude protein concentrate ration should be fed.

- ⁴ Includes milk hauling, co-op charges, capital retained, parlor supplies, DHI, and breeding and cattle marketing charges.

- ⁵ One-half of sum of Lines 4 through 9 times percent of year owned (50%) times 11% interest. Doesn't include interest on investment in cattle, facilities, and equipment.

- ⁶ Other cash costs such as real estate and property taxes, building insurance and repairs, hired labor, and miscellaneous expense are to be accounted for on Form 6, FM 7536. These costs on a per cow basis may include: \$15 for taxes, \$25 insurance and building repairs, and \$275-\$350 labor charge for a total cost of \$230-\$380 per cow. This doesn't include depreciation or debt servicing (interest and principal) on cows and facilities.

- ⁷ Procedure for converting hay, silage, and pasture needs per dairy cow:

Forage needs are best calculated on a dry matter basis. Use the following as a guide for percent dry matter: hay, 90%; corn silage, 30%; haylage, 40%; and pasture, 20%. The dairy forage intake on a dry matter basis is about 2.1% of the cow's average body weight.

$$\text{Forage intake} = \frac{2.1\% \times \text{body weight}}{100} = \text{lbs. D.M. per day}$$

For a cow weighing 1,300 lbs., forage intake would be:

$$\frac{2.1\% \times 1,300}{100} = 27.3 \text{ lbs. D.M. per day}$$

⁷Continued

Forage intake for a year can be calculated as follows:

$$\frac{\text{Lbs. D.M. per day} \times 365 \text{ days}}{\% \text{ D.M. of forage}} = \text{lbs. forage per year}$$

$$\frac{27.3 \times 365}{90\% \text{ (hay)}} = 11,072 \text{ lbs. or 5.5 tons hay}$$

Select the forage that you can best produce:

5.5 tons hay equivalent at 90% dry matter is required per cow. The 5.5 tons does not include feed for replacement heifer.

OR 14.6 tons corn or sorghum silage at 30-35% D.M. (33%); (68 therms or 68% TDN).

OR 12.1 tons hay crop silage or haylage at 35-50% D.M. (40%).

OR 132.6 pounds of good pasture per day at 20% D.M.

Typical combinations to supply 5.5 tons hay equivalent:

No pasture with:

Half D.M. from hay and half D.M. from silage:

2.8 tons hay

7.5 tons corn or sorghum silage or 6.2 tons hay crop silage

OR Limited hay and heavy silage feeding:

1.0 ton hay

12.0 tons corn or sorghum silage or 9.9 tons hay crop silage

OR Limited silage and heavy hay feeding:

3.6 tons hay

5.0 tons corn or sorghum silage or 3.8 tons hay crop silage

2 months pasture with:

Equal hay and silage:

2.3 tons hay

6.3 tons corn or sorghum silage or 5.2 tons hay crop silage

OR Hay alone:

4.8 tons hay

OR Silage and limited hay:

1.0 ton hay

10.0 tons corn or sorghum silage or 8.3 tons hay crop silage

6 months pasture with:

Equal hay and silage:

1.6 tons hay

4.4 tons corn or sorghum silage or 3.6 tons hay crop silage

OR Hay alone:

3.3 tons hay

OR Silage and limited hay:

1.0 ton hay

6.0 tons corn or sorghum silage or 5.0 tons hay crop silage

⁷Continued

The above forage rations are based on minimum hay feeding or about 5 lbs. per head per day. Where silage is fed, a minimum of 27 lbs. of corn or sorghum silage is offered (or 20 lbs. hay crop silage) per day. This is probably as low or lower than most dairymen will want to feed if they choose to feed silage at all.

Even on pasture we are assuming that 5 lbs. of hay will be offered daily.

Corn and sorghum silages are considered to be comparable; i.e., the two silages will be consumed in approximately equal quantities. However, it must be recognized that the energy value of corn silage is considerably higher--60-70 therms as compared to 50 to 60 therms of net energy per 100 lbs. dry matter. Consequently, more grain will be needed where sorghum silage is fed.

More grain will be needed, too, where hay crop silages are fed. Although in the case of hay crop silages there will be some savings in protein needed in grain mix as compared to when corn or sorghum silage is fed.

Hay reported as being fed is considered to be of the following quantities:

- (1) Alfalfa hay - 55 therms or 54% TDN
- (2) Mixed hay - 50 therms or 51% TDN

The quality of forage can vary widely. This should always be remembered! Further, quantity will not make up for quality. Actually, a lower quantity of poorer quality will be accepted by all animals.

Credit: Missouri Farm Planning Handbook (Manual 75). University of Missouri-Columbia: College of Agriculture and Extension Division, 1986.

Buying or Leasing Dairy Cows

Table 1: Estimated Cash Flow Budgets to Acquire a Dairy Cow by Leasing or Cash Purchase

	AN EXAMPLE			
	Purchase Plan (4-year plan)		Lease Plan (45 months)	
	Per Mo.	Total	Per Mo.	Total
1. Purchase cost of cow, \$1,200 principal payment	\$25.00	\$1,200		
2. Interest at 12% ¹	7.92	380		
3. Death loss, 4% annually of purchase price	4.00	192	\$.40	\$ 18 ²
4. Cow replacement cost (25%) for two years	7.29	350 ³	1.33	60 ⁴
5. Advance payment, 12% of line 1			3.20	144
6. Monthly payment, 4% of line 1			48.00	2,160
7. Insurance	1.50	72	1.60	72
8. Property taxes	.20	10	.22	10
9. Final payment to acquire title to cow				1
10. Total cash dollars	\$45.91	\$2,204	\$54.75	\$2,465
11. Annual cost for 4 years		\$ 551		\$616
12. Less estimated tax savings (Table 4, line 6 plus line 1)		\$ _____		\$ _____
13. Annual cost after estimated annual tax savings (line 11 minus line 12)		\$ _____		\$ _____

¹Amortized over 4 years at 12% interest

²10% x \$1,200 cow = \$120 or \$10/month x 4% x 45 months

³Cow cost \$1,200 — \$500 salvage value of cow x 25% annual replacement rate x 2 years

⁴Cow cost \$1,200 x 10% x 25% annual replacement rate x 2 years

Table 2: Estimated Cash Flow Budgets to Acquire a Dairy Cow by Leasing or Cash Purchase

	MY SITUATION			
	Purchase Plan		Lease Plan	
	Per Mo.	Total	Per Mo.	Total
1. Purchase cost of cow, \$ _____ principal payment	\$ _____	\$ _____	XXXXXXXXXX	XXXXXXXXXX
2. Interest _____ % ¹	_____	_____	XXXXXXXXXX	XXXXXXXXXX
3. Death loss, _____ % annually of purchase price	_____	_____	\$ _____	\$ _____ ²
4. Cow replacement cost for _____ years	_____	_____	_____	_____
5. Advanced payment	XXXXXXXXXX	XXXXXXXXXX	_____	_____
6. Monthly payment, _____ % of line 1	XXXXXXXXXX	XXXXXXXXXX	_____	_____
7. Insurance	_____	_____	_____	_____
8. Property taxes	_____	_____	_____	_____
9. Final payment to acquire title to cow	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	_____
10. Total cash dollars	\$ _____	\$ _____	\$ _____	\$ _____
11. Annual cost, _____ years	XXXXXXXXXX	\$ _____	XXXXXXXXXX	\$ _____
12. Less estimated tax savings (Table 4, line 6 plus line 1)		\$ _____		\$ _____
13. Annual cost after estimated annual tax savings		\$ _____		\$ _____

¹Amortized over _____ years at _____ interest.

²Calculate lessee's death loss according to lease agreement.

³Cow cost \$ _____ — \$ _____ salvage value of cow x _____ % annual replacement rate x _____ years.

⁴\$ _____ cow cost x _____ % annual replacement rate x _____ years.

Credit: "Buy or Lease Dairy Cows" (G430). Columbia: University of Missouri-Columbia Extension Division, 1985.

UNIT - ADVANCED DAIRY

Lesson 3: Comparative Advantages of Dairy

Objective: The student will compare labor and capital advantages of a dairy enterprise.

Study Questions

1. What are the advantages of producing Grade A milk as compared to manufacturing-grade milk?
2. What are the advantages of using dry lots and automation for the milking herd?
3. What are the advantages of pasture grazing the milking herd?
4. How does raising heifers compare to purchasing heifers?
5. What are the major facility costs in raising and maintaining dairy animals?

References

1. Gillespie, James R. Modern Livestock and Poultry Production, 2nd ed. Albany, NY: Delmar, 1983.
2. Advanced Dairy (Selected Readings). University of Missouri-Columbia: Instructional Materials Laboratory, 1987.
3. Handout
 - a) HO 3.1: Replacement Dairy Heifer Budget

UNIT - ADVANCED DAIRY

Lesson 3: Comparative Advantages of Dairy

TEACHING PROCEDURES

A. Review

Review the previous lesson.

B. Motivation

Dairy farmers produce and sell a greater percentage of fluid grade milk as compared to manufacturing-grade milk. Use Table 3.1 in the selected readings to illustrate this fact. Producing high-grade milk requires a carefully planned program of dairy herd breeding, nutrition, health care and good milking practices.

C. Assignment

D. Supervised study

E. Discussion

1. Ask the students about the current price difference between manufacturing-grade and Grade A milk. Discuss the merits of milking Grade A as compared to the lower grade.

What are the advantages of producing Grade A milk as compared to manufacturing-grade milk?

- a) Grade A milk sells for a higher price per cwt than manufacturing-grade milk.
 - b) Certain production regulations are very similar for both Grade A and manufacturing-grade milk.
 - 1) Current somatic cell count regulations are the same.
 - 2) Current milking barn requirements are very similar.
 - 3) Bacteria count can be higher for manufacturing milk.
 - c) Cow herd management practices are the same for both grades.
 - 1) Rations need to be balanced to meet daily needs.
 - 2) Herd health programs need to be maintained.
 - 3) Recordkeeping programs are essential.
 - d) Producers with facilities that require little remodeling may choose to produce manufacturing milk because the initial start-up investment is small.
 - e) Producers without facilities or those that require costly remodeling may find it profitable to design Grade A facilities from the beginning in order to sell at a higher price.
2. Ask the students whether the number of dairies in the U.S. is increasing or decreasing. What are some reasons behind this

trend? How are fewer dairy farmers meeting the increased labor and management demands of larger herds? Automation and dry lots are two means of increasing the efficiency of dairy production. Refer the students to Table 3.2 and 3.3 of the selected readings and discuss the trend in the number of dairies and herd size.

What are the advantages and disadvantages of using dry lots and automation for the milking herd?

- a) Advantages of dry lots
 - 1) Higher utilization of forages
 - (a) Less forage is wasted by trampling.
 - (b) Cattle are less selective when consuming forage.
 - 2) Optimum feed intake and utilization
 - (a) Maximum utilization can be made of automatic concentrate feeders.
 - (b) Cows with ready access to feeders consume more.
 - (c) Cows do not expend energy foraging on pasture.
 - 3) Reduced time requirement
 - (a) Moving cows to and from milk barn
 - (b) Feeding cows, if automation is used
 - 4) Closer observation
 - (a) During calving
 - (b) Spotting cows with health problems
 - 5) Greater control over total operation
- b) Disadvantages of dry lot
 - 1) High facility cost
 - (a) Comfortable loafing barn
 - (b) Adequate corral system
 - 2) High equipment cost
 - (a) Harvest and handling equipment for forage
 - (b) Added storage facilities for harvested forage
 - (c) Automatic feeders
 - 3) Cattle lameness if confined entirely on concrete
 - 4) Potentially difficult heat detection
- c) Advantages of automation
 - 1) Less labor is required in herd milking and management.
 - 2) Using a pipeline system to transport milk eliminates carrying and handling the milk.
 - 3) Feeding systems can be installed that provide a specific amount of feed to each cow.
 - (a) Equipment used to handle bulky feeds such as hay and silage include silo unloaders, bunk feeders and self-propelled electric feed carts.
 - (b) Grains are usually easy to move with augers and conveyers.
 - 4) Automatic milker machine take-off units and increased milking stalls can help a producer milk more cows in the same amount of time.
 - 5) The milking parlor can be insulated, heated, ventilated or air-conditioned according to the climate.
- d) Dry lots and automation = trading labor for equipment

- e) Missouri Dairy Herd Improvement Association 1985 summary
 - 1) Pasture usage in the state has declined steadily since 1976.
 - 2) In 1985, 97 of 735 producers did not utilize pastures.
3. Ask the students how increased dairy automation has affected pasture grazing of the dairy herd. How has pasture grazing been affected by the increases in land prices?

What are the advantages of pasture grazing the milking herd?

- a) Pastures may lessen feed costs since forage is cheaper than harvested and stored hay or silage.
 - b) Pastures can lessen the hazard of nutritional deficiencies by providing a good source of high quality protein, vitamins and minerals.
 - c) Pastures lessen the occurrence of communicable diseases.
 - d) Using pastures lessens costs for buildings and equipment.
 - e) Pastures allow for greater flexibility where renters are involved or where uncertainties exist with a long-range program.
 - f) Depending upon the type of pasture system, using pastures may not require high-level management skills on the part of the dairy farmer.
 - g) Pastures help conserve soil on rolling land.
 - h) Pastures help improve reproduction.
 - 1) Improved heat detection if herd is watched
 - 2) Valuable exercise
 - i) Pastures maximize the use of non-crop areas.
 - j) Advantages of pastures can be multiplied if more intensive management is applied.
 - 1) Interseeding legumes such as red clover or alfalfa into existing grass stands
 - 2) Destroying tall fescue infected with endophyte fungus
 - 3) Maintaining adequate soil fertility
 - 4) Developing a grazing management system
4. Ask students about prices paid for replacement heifers purchased locally. Refer students to Table 3.4 in the selected readings and discuss costs entailed in raising replacements.

How does raising heifers compare to purchasing heifers?

- a) Dairy farmers raise heifers for their own use or for others to purchase.
 - 1) Business aspects must be considered.
 - 2) Producers intend to earn a profit by selling replacement heifers.
- b) Raising replacements eliminates unknowns and gives additional facts and control.
 - 1) Health status
 - 2) Age

- 3) Pedigree
 - 4) Sire selection
 - 5) Genetic potential
 - c) Raising replacement heifers eliminates transportation stress and the cost, time and effort required to locate good replacements.
 - d) Cost of feed accounts for 50-58% of the cost of raising replacements.
 - e) Dairy farmers can also save money when raising replacements.
 - 1) Feeding calves milk replacer or pickled colostrum
 - 2) Using improved pasture for seven months of the year
 - f) Total cost of raising replacement heifers to 24 months of age ranges from \$700 to \$800 per animal.
5. Economical dairy production depends largely on the investment in practical buildings and equipment, as well as the care, feeding and management of the herd. Refer students to the selected readings for this lesson and Lesson 15 for further descriptions of facilities.

What are the major facility costs in raising and maintaining dairy animals?

- a) Milking barns or parlors
 - 1) Double four: \$20,000-\$40,000
 - 2) Single: \$5,200-\$22,000
- b) Milking equipment (used or new): \$10,000-\$30,000
- c) Bulk tanks (new): \$10 per gallon
- d) Other items
 - 1) Water conditioner: \$500-\$600
 - 2) Cleaning in-place unit: \$40-\$60
 - 3) High-pressure water pump (for cleanup): \$350-\$425
 - 4) Alternator: \$2,500-\$4,000
 - 5) Bulk feed storage tank, 8.7 ton capacity: \$1,100-\$1,500
 - 6) Steel pipe (per ft.): \$5-\$9
 - 7) Loafing barn (per stall): \$320-\$425
 - 8) Utah free stalls (per stall): \$175-\$225
 - 9) Concrete for walkways from silage or hay areas to loafing areas or parlor: \$35-\$40 per yard
 - 10) Animal waste control facilities: \$100-\$400
 - 11) Automatic take-off units (detachers): \$250-\$1,000 per stall
- e) Calf raising facilities
 - 1) Individual stall or calf hutches: \$80-\$100
 - 2) Shed space after weaning: \$50-\$60

F. Other activities

G. Conclusion

Dairy cows are often described as living milk factories; it takes the best quality inputs and careful practices within a factory to allow production of the highest quality product possible. Good feeding practices, dry periods, automation, care in replacing heifers and building proper dairy facilities all work to the advantage of the dairy farmer in yielding a high-grade milk product.

H. Competency

Evaluate the comparative advantages (labor vs. capital) of the dairy enterprise.

I. Answers to Evaluation

1. a
2. c
3. d
4. c
5. less
6. eliminates
7. specific
8. Answer should be one of the following:
 - a) Raising replacements assures dairy farmers of their heifer's health status, age and pedigree.
 - b) Raising replacements eliminates transportation stresses and the cost, time and effort required to locate good replacements.
9. Increased product value
10. When using pastures, less grain and protein supplement are required in the cow's diet. Also, forage is cheaper than harvested and stored hay or silage.

UNIT - ADVANCED DAIRY

Name _____

Date _____

Lesson 3: Comparative Advantages of Dairy

EVALUATION

Circle the letter of the best choice.

1. Cows kept in a dry lot system will usually consume _____ feed.
 - a. More
 - b. Less
 - c. The same amount of
2. Identify the disadvantage of a dry lot program.
 - a. Less forage is wasted.
 - b. Cows can stand on concrete.
 - c. Less time is required to handle cows.
 - d. Cows don't expend energy grazing.
3. The most expensive facility cost for a dairy operation is usually for the _____.
 - a. Milking equipment
 - b. Bulk tanks
 - c. Calf raising facilities
 - d. Milking barns or parlors
4. What is the estimated cost of a double-four milking parlor?
 - a. \$ 5,000-\$10,000
 - b. \$10,000-\$20,000
 - c. \$20,000-\$40,000
 - d. \$40,000-\$60,000

Complete each of the next four statements by circling the appropriate word or filling in the blank.

5. Milking and managing the dairy herd in a dry lot system requires (more/-less) labor.
6. Using a pipeline system to transport milk (eliminates/requires) carrying and handling the milk.
7. Feeding systems that provide a (specific/random) amount of feed to each cow can be installed.

8. Describe one advantage of raising replacement heifers.
9. List the main advantage of producing Grade A milk.
10. Briefly explain how pastures lessen dairy feed costs.

Replacement Dairy Heifer Budget

Description of Production: Raising a day-old heifer to 24-26 months of age ready to freshen. The requirements below are for one heifer for the entire two-year period.

		MY FARM
1. Details of gross receipts: Day-old heifer kept for 24-26 months ready to go into milking herd	Value of bred heifer ready to freshen \$ 800	
2. GROSS RECEIPTS PER HEIFER	\$ 800	
3. VALUE OF DAY-OLD HEIFER	\$ 100	
4. Feed : Concentrate: Milk replacer, \$50/cwt. Starter, \$10/cwt. Growing ration, \$8/cwt. Grain mix, \$7.50/cwt. Forage: Hay, \$50/T. Pasture, \$7/AUM	50 lbs. \$ 25 100 lbs. 10 450 lbs. 36 1,300 lbs. 98 3 T. 150 9 AUM 63	
5. TOTAL FEED COSTS	\$ 382	
6. Machinery operating costs, feed preparation, etc.	\$ 10	
7. Veterinary & medicine	25	
8. Other livestock materials & services	40	
9. Utilities	10	
10. Dairy buildings, equipment & fence repairs	18	
11. Other	6	
12. Death loss on heifer ²	17	
13. Operating interest ³	14	
14. TOTAL OTHER VARIABLE COSTS (add Lines 6 through 13)	\$ 140	
15. TOTAL ALL VARIABLE COSTS (Lines 3 + 5 + 14)	\$ 622	
16. INCOME OVER VARIABLE COSTS ⁴ (Line 2 minus Line 15)	\$ 178	
17. Labor hours	20 hrs.	
18. Breeding herd investment	\$ 400	

¹Includes nipple pails, bedding, and breeding charge.

²Death loss estimated at 10%, largely occurring before weaning. Value of day-old heifer plus value of milk replacer, starter, and grower times 10%.

³One-fourth of sum of Lines 5 through 12 times 11% interest.

⁴Other cash costs such as insurance, real estate and property taxes, and hired labor are to be accounted for on Form 6, FM 7536.

Rev. 2/86

Credit: Missouri Farm Planning Handbook (Manual 75). University of Missouri-Columbia: College of Agriculture and Extension Division, 1986.

UNIT - ADVANCED DAIRY

Lesson 4: Milk Secretion

Objective: The student will describe how feeding and disease control relate to the process of milk secretion.

Study Questions

1. What are the parts of the mammary system?
2. What hormones are involved in the milk secretion process?
3. What is the sequence of milk let-down?
4. What are the major milking conditions associated with lactation?
5. How are the major milking conditions controlled?
6. What is the recommended procedure for drying off a cow and maintaining her during the dry period?

References

1. Gillespie, James R. Modern Livestock & Poultry Production, 2nd ed. Albany, NY: Delmar, 1983. Units 40-42: Management of the Dairy Herd, Milking Management and Dairy Herd Health
2. Advanced Dairy (Selected Readings). University of Missouri-Columbia: Instructional Materials Laboratory, 1987.
3. University of Missouri-Columbia Extension Division agricultural guides
 - a) G3305: Somatic Cell Count (1981)
 - b) G3653: Using the California Mastitis Test (1986)
4. Transparency Master
 - a) TM 4.1: Parts of the Mammary System

UNIT - ADVANCED DAIRY

Lesson 4: Milk Secretion

TEACHING PROCEDURES

A. Review

Review the previous lesson.

B. Motivation

The class Mammalia consists of warm-blooded, hairy animals that give birth to living young and suckle them for a time on a secretion from the mammary glands. Although milk composition for mammals varies, the milk secretion process across these different groups is very similar.

C. Assignment

D. Supervised study

E. Discussion

1. The udder of a cow can weigh 7-165 pounds. In many cases, the udder must also be able to support up to 80 pounds of milk. Although udder sizes vary for different breeds, the essential mammary parts are the same. Distribute HO 4.1 and lead the students in a discussion of the mammary system's anatomy.

What are the parts of the mammary system?

- a) External structures
 - 1) Udder: mammary glands consisting of four separate quarters
 - 2) Teats: hollow extensions of the udder
 - b) Internal structures
 - 1) Alveoli: basic milk-producing units of the udder
 - 2) Milk cavity: collection area within an alveolus
 - 3) Small milk duct
 - 4) Large milk duct
 - 5) Gland cistern: collection point above teat cistern
 - 6) Sphincter muscle: muscle surrounding streak canal which prevents milk leakage
 - 7) Teat cistern: storage area above streak canal
 - 8) Streak canal: teat opening
2. Ask the students to define and describe the function of a hormone, the substance formed by one organ and conveyed to another, which stimulates the second organ to function by means of its chemical activity. What are some effects hormones have on the human body?

What hormones are involved in the milk secretion process?

- a) Oxytocin
 - b) Adrenalin
3. For a dairy cow to produce one gallon of milk, more than 500 gallons of blood must pass through its udder. Blood supports the physiological activity of cells in the milk-secreting tissue and transports hormones to the udder, which controls milk let-down.

What is the sequence of milk let-down?

- a) The udder is stimulated by a calf or a milker.
 - b) Nerve impulses are conducted to the posterior pituitary at the base of the cow's brain.
 - c) The posterior pituitary releases the hormone oxytocin into the blood stream.
 - d) The blood transports oxytocin to the udder.
 - e) Oxytocin causes the smooth, muscle-like cells surrounding each alveolus to contract, thereby forcing the milk into the large ducts and cisterns of the udder.
 - f) When a cow is frightened or angry, milk let-down can be blocked by the action of the hormone adrenalin.
4. Ask the students with dairy experience to describe problems they have encountered with dairy diseases.

What are the major conditions associated with lactation?

- a) Nutritional diseases
 - 1) Ketosis
 - (a) Most often develops within the first 30 days after lactation
 - (b) Characterized by a drop in milk production, hypoglycemia, ketonuria and a rapid loss of weight
 - (c) Major causative factor an inadequate supply of glucose precursors in the blood
 - 2) Milk fever
 - (a) Caused by a drop in blood calcium at the onset of lactation
 - (b) Characterized by a loss of appetite, subnormal temperature and an unsteady gait, followed by nervousness and collapse or loss of consciousness
- b) Udder edema
 - 1) May be caused by a reduction of blood proteins and increased blood flow at calving time
 - 2) Characterized by an accumulation of fluid in the intercellular spaces of the udder and those spaces forward of the udder

- 3) Severity is increased by a high intake of sodium chloride or potassium chloride
- c) Mastitis
 - 1) When mammary tissue is bruised or becomes infected, inflammation results.
 - (a) This inflammation is called mastitis.
 - (b) The cow's body responds to repair the damage through the production of leukocytes (white blood cells).
 - (c) Leukocytes attempt to destroy infecting microorganisms.
 - 2) Leukocytes are present in small numbers in all milk, unless infection is present.
 - 3) Diagnostic tests measure the somatic cells (leukocytes and other body cells) in milk.
 - 4) Mastitis is described in several degrees of severity.
 - (a) Subclinical: often unrecognized, no visible changes in the udder or milk, recognized only by diagnostic tests
 - (b) Clinical: pronounced changes in the udder; flaking, clotting or strings of pus in milk
 - (c) Acute clinical: hot, hard and sensitive udder; increased body temperature; failure to eat; death
 - (d) Chronic: can develop from persistent (usually unnoticed) infection

5. Identify with students the ingredients in a dairy cow's ration which help control milking diseases. What are some nutrients that cows on pasture require as a supplement to help prevent milking diseases?

How are the major milking diseases controlled?

- a) Ketosis
 - 1) Maintain sound feeding practices that include an adequate intake of carbohydrates
 - 2) Special care for cows known to be susceptible
 - (a) Add sodium propionate to the grain ration.
 - (b) Administer cortisone immediately after calving.
- b) Milk fever
 - 1) Excessive calcium intake by problem cows should be avoided during the dry period.
 - 2) Calcium levels after calving should be raised rapidly to meet high lactation requirements.
 - 3) Administer 500 cc of calcium gluconate intravenously to problem cows 12-24 hours after calving.
- c) Udder edema: restrict salt intake
- d) Mastitis
 - 1) Milk all diseased cows last.
 - 2) Use a strip cup to obtain foremilk samples from each quarter in order to detect new cases of mastitis.

- 3) Before milking, wash udder with clean, individual towels dampened with a chlorine solution.
 - 4) Wash, disinfect and dry hands before milking cows.
 - 5) Milk cows regularly.
 - 6) Remove teat cups immediately when the milk flow stops.
 - 7) Dip the ends of teats in a chlorine or other commercial solution after milking.
 - 8) Periodically check the milking machine, vacuum and rubber parts for damage.
 - 9) Keep the equipment and premises sanitary at all times.
 - 10) Never make a cow hurry her movements.
6. For increased production during lactation, dairy cows are given a rest during the drying off period. The dry cow then recovers from a heavy milk-producing period, develops the unborn calf and stores up reserves for the next milking period. How do dairy farmers handle cows that are producing high levels of milk at the end of lactation?

What is the recommended procedure for drying off a cow and maintaining her during the dry period?

- a) Dry cows off 60 days before calving.
 - 1) Discontinue grain feeding and milking abruptly.
 - 2) Allow back pressure in the udder to build up.
 - 3) Examine the udder at intervals for fever or swelling but do not milk it out.
 - 4) At the end of seven days (when the udder is soft and flabby), milk out what little secretion remains.
 - 5) At the last milking, treat all cows with dry cow treatment; the infusion of a high-potency antibiotic can control mastitis.
 - (a) Old infections are most easily and effectively attacked at this time.
 - (b) Most new infections occur in the first 10 days to two weeks of the dry period.
- b) Feed a special dry cow grain mix during the dry period.
 - 1) Mix should contain 2-4% less protein than the lactating mix.
 - 2) A diet with a calcium/phosphorous ratio of 2:1 should lessen the occurrence of milk fever.
 - 3) Mineral-fortified feed and a supplement of self-feeding minerals are suggested.
 - 4) The feeding level during the dry period should be determined by the condition and size of cow and the quality of roughage.
 - 5) Desirable dry cow gains are as follows.
 - (a) 75-150 pounds for a 800-1,000 lb. cow
 - (b) 100-200 pounds for a 1,000-1,200 lb. cow
 - (c) 125-250 pounds for a 1,200-1,400 lb. cow

- c) Increase concentrate the last 2-3 weeks of dry period.
 - 1) Feed the cow four pounds of concentrate per day beginning 2-3 weeks before freshening.
 - 2) Increase concentrate feeding by 1 lb. each day until the cow is consuming 1.0-1.5 lb. of concentrate per hundredweight.
 - 3) Increase concentrate feeding beginning the second day after freshening by 2-3 lb. per day according to the cow's appetite or maximum milk production.

F. Other activities

- 1. Dissect and observe the parts of a cow's udder in class.
- 2. Compare a list of the components of cow's blood to the components of cow's milk.
- 3. Compare the ingredients in a dry cow's ration to the ration of a lactating cow.

G. Conclusion

Milk secretion is a process common to all warm-blooded mammals. The ability of dairy cattle to produce large amounts of milk is the main reason why they play an important part in U.S. agriculture.

H. Competency

Describe the process of milk secretion.

I. Answers to Evaluation

- 1. f
- 2. d
- 3. a
- 4. b
- 5. c
- 6. g
- 7. e
- 8. d
- 9. a
- 10. less
- 11. increased
- 12. oxytocin
- 13. adrenalin
- 14. Inadequate supply of glucose precursors in the blood
- 15. Drop in blood calcium at the onset of lactation
- 16. Reduction of blood proteins and increased blood flow at calving time
- 17. Injury or bacteria in the udder

18. Answers should include four of the following:
- a) Milk all diseased cows last.
 - b) Use a strip cup to obtain foremilk samples from each quarter in order to detect new cases of mastitis.
 - c) Wash udder before milking with clean individual towels dampened with a chlorine solution.
 - d) Wash, disinfect and dry hands before milking cows.
 - e) Milk cows regularly.
 - f) Remove teat cups immediately when the milk flow stops.
 - g) Dip the ends of teats in a chlorine solution (200 ppm) after milking.
 - h) Sprinkle the floor with lime or superphosphate before sweeping.
 - i) Periodically check the milking machine, vacuum and rubber parts for damage.
 - j) Keep the equipment and premises sanitary at all times.
 - k) Never make a cow hurry her movements.

UNIT - ADVANCED DAIRY

Lesson 4: Milk Secretion

Name _____

Date _____

EVALUATION

Column A contains descriptions of a cow's mammary system parts. Column B contains the parts of a dairy cow's mammary system. Select the part in Column B that matches the description in Column A, placing the letter of the best choice in the space provided.

<u>A</u>	<u>B</u>
1. ____ Storage area between udder and streak canal	a. Udder
2. ____ Small milk passage within alveoli	b. Alveoli
3. ____ Mammary glands consisting of four separate quarters	c. Milk cavity
4. ____ Basic milk-producing units of the udder	d. Small milk duct
5. ____ Collection area within an alveolus	e. Gland cistern
6. ____ Teat opening	f. Teat
7. ____ Collection point above teat cistern	g. Streak canal

Complete the following statements by circling the letter of the best answer.

8. During milk let-down, the posterior pituitary gland at the base of the cow's brain is stimulated by nerve _____.
a. Secretions
b. Hormones
c. Vibrations
d. Impulses
9. To lessen the occurrence of milk fever, dry cow grain mixes should include a balance of _____.
a. Calcium and phosphorous
b. Nitrogen and iodine
c. Copper and iron
d. Magnesium and cobalt

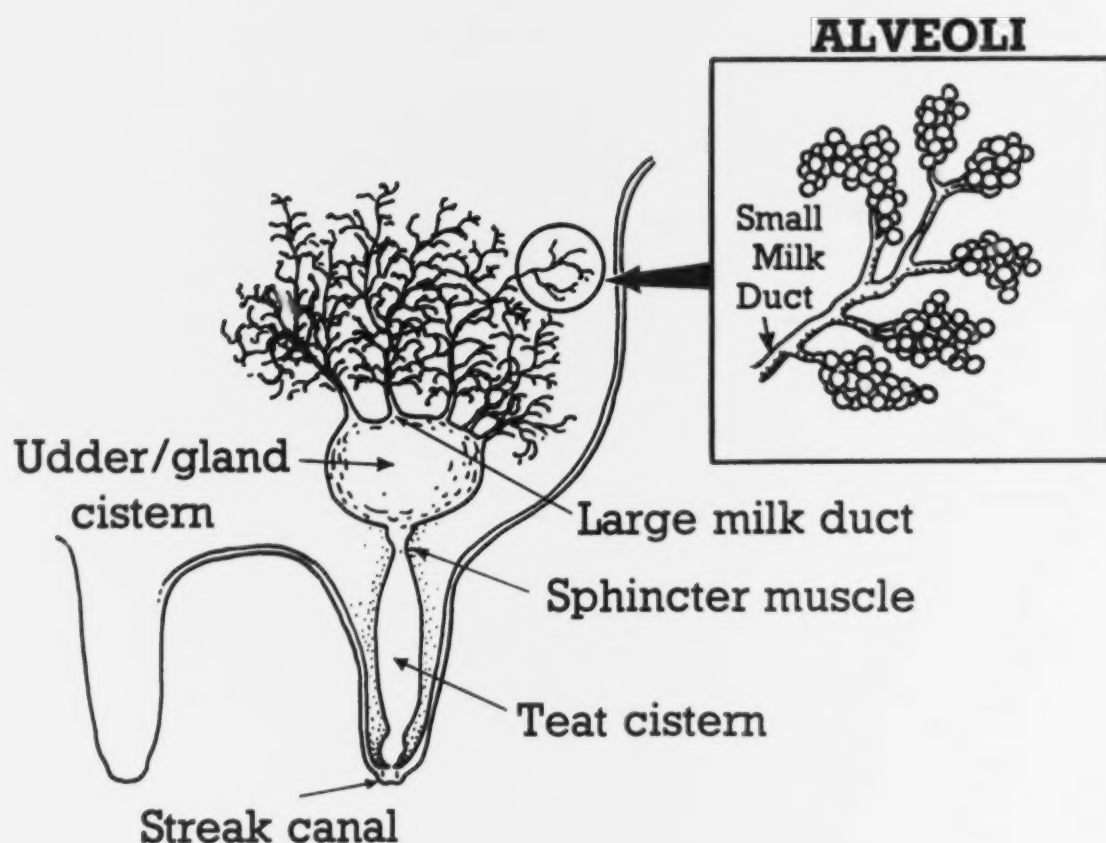
Complete the following statements by circling or filling in the missing word.

10. The dry cow grain mix should include 2-4% (more, less) protein than the lactating mix.
11. During the last 2-3 weeks of the dry period, concentrate feeding should be (increased, decreased).
12. Milk secretion is partly the result of stimulus produced by the hormone _____.
13. When a cow is frightened or angry, milk let-down may be blocked by the action of the hormone _____.

In questions 14-17, briefly describe the cause of each milking disease.

14. Ketosis:
15. Milk fever:
16. Udder edema:
17. Mastitis:
18. Explain four methods of controlling ketosis.
 - a.
 - b.
 - c.
 - d.

Parts of the Mammary System



Credits: Ensminger, M. E. Dairy Cattle Science. 2nd ed. Animal Agriculture Series. Danville, Ill.: Interstate Printers and Publishers, 1980, pg. 446.

Turner, Charles W. Harvesting Your Milk Crop. Oakbrook, Ill.: Babson Bros. Dairy Research and Educational Service, 1981.

UNIT - ADVANCED DAIRY

Lesson 5: Milking and Sanitation Procedures

Objective: The student will describe milking and sanitation procedures that will assure quality milk.

Study Questions

1. What are the minimum standards for producing Grade A milk?
2. What are the minimum standards for producing manufacturing-grade milk?
3. What sanitation procedures are recommended in the processing of milk?
4. How does water type and temperature affect dairy sanitation?
5. What is the recommended procedure for milking dairy cows?
6. What is the purpose of teat dipping?
7. What are the recommended milking clean-up procedures?

References

1. Gillespie, James R. Modern Livestock and Poultry Production, 2nd ed. Albany, NY: Delmar, 1983. Unit 41: Milking Management
2. Advanced Dairy (Selected Readings). University of Missouri-Columbia: Instructional Materials Laboratory, 1987.

UNIT - ADVANCED DAIRY

Lesson 5: Milking and Sanitation Procedures

TEACHING PROCEDURES

A. Introduction

B. Motivation

Good milking depends largely on the person doing the milking. There are extensive state and federal regulations for dairy milking and for processing milk to be used in manufactured products. Ask the students to explain some reasons for the variations in state dairy regulations. What is the importance of federally regulating the dairy industry?

C. Assignment

D. Supervised study

E. Discussion

- i. Raw milk would likely be sold more widely if it were not for the risk of contracting disease. Ask the students to name procedures aimed at preventing the spread of milk diseases. Pasteurization is a method of processing which destroys bacteria that cause milk deterioration and disease. Pasteurization inactivates enzymes such as natural milk lipase, which can detract from milk quality.

What are the minimum standards for producing Grade A milk?

- a) Temperature
 - 1) Milk must be cooled to 45F or less within two hours after milking.
 - 2) The blended temperature after the first and subsequent milkings should not exceed 50F.
- b) Bacterial limits (maximum per milliliter)
 - 1) Individual producer's milk must not exceed 100,000 before it is mixed with other producers' milk.
 - 2) The count from commingled milk must not exceed 300,000 prior to pasteurization.
- c) Somatic cell count: maximum of 1,000,000 per milliliter for individual producer's milk
- d) Other requirements
 - 1) No addition of water
 - 2) Freedom from antibiotics, pesticides
 - 3) Exclusion of milk with colostrum or from diseased animals (includes mastitic milk)
 - 4) Proper construction and maintenance of the milking parlor and related facilities

2. Ask the students to name some examples of food products that are made from manufacturing-grade milk. Note that Grade A milk which is not used for fluid consumption is mixed with manufacturing-grade milk to produce dairy products. Compare the standards for producing manufacturing and Grade A milk.

What are the ~~minimum~~ standards for producing manufacturing-grade milk?

- a) Sight, flavor and odor
 - 1) Flavor and odor of acceptable raw milk should be fresh and sweet.
 - 2) Milk should be free of off-flavors and off-odors that adversely affect the finished product.
 - 3) Milk should show no abnormal condition (curdled, ropy, bloody or in mastitic condition).
- b) Sediment content: must not exceed 2.5 milligrams per pint
- c) Manufacturing-grade milk classification
 - 1) A maximum bacterial count of 1,000,000 per milliliter is allowed.
 - 2) For the first three years after a state's adoption of federal requirements, undergrade milk is that which has a bacterial count of more than 3,000,000 per milliliter.
- d) Somatic cell count: less than 1,000,000 per milliliter (effective Jan. 1, 1988)
- e) Mandatory participation in USDA programs for brucellosis and tuberculosis control
- f) Sale of abnormal milk (containing antibiotics, pesticides or other chemical residues in excess of established limits or from cows with mastitis) prohibited

3. Ask the students to describe some potential situations in which a milker can cause contamination. What precautions will a good milker take to help prevent milk contamination?

What sanitation procedures are recommended in the processing of milk?

- a) Use water from a properly maintained and sanitary source.
- b) Use equipment built for dairy operations and maintain this equipment in clean condition.
- c) Use single-service articles only once.
- d) Store equipment properly to prevent contamination.
- e) Handle equipment properly to prevent contamination.
- f) Locate equipment and dairy operations to help prevent overcrowding and contamination.
- g) Protect milk from contamination by cleanser solutions, insects, dust, condensation, manure or splashing.
- h) Store antibiotics and medicines properly.
- i) Maintain personal cleanliness.
- j) Cool milk properly to prevent growth of bacteria.

4. Salts that are deposited on equipment cause problems with milkstone deposits. Approximately half of the milkstone accumulation on dairy equipment comes from milk solids and half comes from minerals contained in water. Use these facts and the information in the selected readings to emphasize the importance of proper cleaning compounds. Define precipitate for the students: to chemically cause a solid substance to be separated from a solution.

How does water type and temperature affect dairy sanitation?

- a) Water type
- 1) Water constituents that precipitate under alkaline conditions and/or when heated cause problems associated with cleaning.
 - (a) Bicarbonates of temporarily hard water are precipitated by most alkaline materials and by heat.
 - (b) Sulfates and chlorides of calcium and magnesium of permanently hard water are precipitated by many alkaline materials but not by heat.
 - (c) Soluble iron and manganese oxides in well-water supplies can produce reddish-brown stains.
 - 2) In heat exchangers (pasteurizers and coolers), lime deposits decrease the efficiency of heat transfer.
 - 3) Salts can leave films in which fat, protein and other milk components combine to form milkstone.
- b) Water temperature
- 1) A temperature of at least 120F should be maintained in the cleaning system (normally means starting at 160F).
 - 2) Water at 140-165F will promote drying of equipment.
 - 3) Milkfat becomes liquid at or above 95F; most milkfat, therefore, can be rinsed away if the water temperature is high enough.
 - 4) Components of some cleansers precipitate as temperatures decrease. Prolonged recirculation may cause the soil to be redeposited because of a temperature drop.

5. Have one of the students with dairy experience explain the importance of milking cows on a regular schedule. What are some of the consequences of milking three times as compared to twice daily?

What is the recommended procedure for milking dairy cows?

- a) Follow a standard schedule.
- 1) Milking should be on the same schedule each day.
 - 2) Milking intervals should be approximately equal (maximum variation: 10 and 14 hours apart).
- b) Prepare the cow.
- 1) Prewash dirty teats with a hose or bucket of warm water.

- 2) Wash teats with warm water containing a sanitizing agent; use disposable paper towels.
 - 3) Dry the teats with a dry paper towel.
 - c) Milk two or three squirts of milk from each quarter.
 - 1) This stimulates milk let-down and removes the first milk (high in bacteria).
 - 2) Observe each quarter for abnormal milk.
 - d) Gently attach the milking machine one minute after stimulating milk let-down.
 - 1) Cow will usually milk out in 3-6 minutes.
 - 2) Watch for a flabby appearance on the lower part of the udder.
 - 3) Shut off the vacuum.
 - e) Gently detach the milking machine, freeing all four teat cups at once.
 - f) Dip teats as soon as possible after milking.
 - 1) Use a solution especially made for teat dipping.
 - 2) Dip about two-thirds of the teat.
 - g) Milk cows with udder infections last.
 - h) Milker's hands should be washed between milkings and after handling any infected cow.
6. Practices that prevent mastitis can be placed in three categories: those which reduce the incidence of exposure to infectious microorganisms, those which affect the immune system of the host and those which reduce physical injury. In which category is teat dipping? What are some preventive measures that fall into the other categories?

What is the purpose of teat dipping?

- a) Kills microorganisms present on teats after milking
 - b) Removes milk from the end of the teat that might serve as a medium for microbial growth
 - c) Penetrates into the streak canal to kill microorganisms
 - d) Helps avoid fly attraction
7. Temperature, physical action and time are important variables of cleaning situations in all dairy operations. What happens when temperature or another variable in the cleaning system is reduced in magnitude? Decreasing the magnitude of any one variable in the system requires an increase in the others.

What are the recommended milking clean-up procedures?

- a) Pre-rinse with plenty of clean, warm (95-110F) water.
 - 1) Most residuals can be removed by proper pre-rinsing.
 - 2) Avoid using hot (140-165F) water for pre-rinsing.
 - (a) Causes milk proteins to denature and adhere to metal surfaces
 - (b) Costs more than warm water
 - 3) Never recirculate the rinse water.

- b) Wash with hot water and an alkaline detergent that has been proven effective under local conditions.
 - 1) An extension agent or equipment dealer can help in choosing an effective detergent.
 - 2) Follow label directions for detergent strength.
 - 3) Maintain a temperature of at least 120F in the system.
- c) Rinse with hot (110F) water immediately after washing.
 - 1) Add approximately one ounce of acid detergent per five gallons of rinse water.
 - 2) Acid detergents help break down both chlorine residues and mineral deposits.
 - 3) Daily use of acid rinse water can take the place of alternate cleaning with an acid detergent.
- d) Drain all lines and invert all items that are to be stored until the next milking.
- e) Sanitize just prior to use.
 - 1) Expose surfaces for at least one minute to a solution containing 150-200 ppm hypochlorite at a temperature of 75F or higher.
 - 2) Iodophors, when used, should be in strengths of 25 ppm or higher and at a temperature of less than 120F.
 - 3) All components should drain dry at wash cycle's end.

F. Other activities

- 1. Visit a local dairy and observe the sanitation procedures followed at milking time.
- 2. Illustrate the function, use and maintenance of a milking machine.
- 3. Demonstrate the different cleansing abilities of acid and alkaline detergents.

G. Conclusion

It would be impossible for dairy producers to provide superior quality milk and milk products without the ability to remove milk soil and to kill residual microorganisms. Understanding the nature of soil and water, the chemistry of cleaning and the fundamentals of sanitization are important aspects of successful dairying.

H. Competency

Describe milking and sanitation procedures that will assure quality milk.

I. Answers to Evaluation

- 1. b
- 2. c
- 3. b
- 4. b

5. Answers should include four of the following:
- a) Fresh and sweet flavor and odor
 - b) Free of off-flavors and off-odors
 - c) No abnormal conditions as indicated by sight and odor
 - d) Sediment content under 2.5 milligrams per pint
 - e) Maximum bacterial count of 1,000,000 per milliliter
 - f) Somatic cell count under 1,000,000 per milliliter
6. two
7. 300,000
8. somatic cell
9. no
10. acid
11. a) Removes soil from udder; helps prevent contamination of milk
- b) Stimulates milk let-down, removes the first milk and enables the milker to check for abnormal milk
- c) Kills microorganisms, removes milk from the end of the teat and helps avoid fly attraction
- d) Helps prevent contamination of milk and the spread of infection among cows
12. a) Causes milk proteins to denature and adhere to metal surfaces
- b) Costs more than warm water
13. Properly storing equipment allows thorough draining and drying.
14. Contamination of cleaned and sanitized equipment by splash, condensation or manual contact can be avoided.

UNIT - ADVANCED DAIRY

Lesson 5: Milking and Sanitation Procedures

Name _____

Date _____

EVALUATION

Circle the letter of the best answer.

1. Bicarbonates of temporarily hard water are precipitated by most alkaline materials and by _____.
 - a. Low temperatures
 - b. Heat
 - c. Pressure
 - d. Moisture
2. Reddish-brown stains from well water are usually caused by soluble oxides of _____.
 - a. Calcium and potassium
 - b. Magnesium and copper
 - c. Iron and manganese
 - d. Sulphur and iodine
3. In heat exchangers such as pasteurizers, coolers and hot water heaters, lime deposits decrease the efficiency of heat _____.
 - a. Production
 - b. Transfer
 - c. Reduction
 - d. Dissipation
4. The water temperature in a dairy cleaning system should be maintained at a temperature of at least _____.

a. 95F	c. 150F
b. 120F	d. 180F
5. Briefly describe four characteristics of manufacturing-grade milk.
 - a.
 - b.
 - c.
 - d.

Complete the following statements in questions 6-10 by circling the appropriate word or words.

6. Milk must be cooled to 45F or less within (two/three) hours after milking.
7. Bacterial count of several Grade A producers' milk mixed together must not exceed (300,000/500,000) per milliliter prior to pasteurization.
8. Individual producers' milk must not exceed a (bacterial/somatic cell) count of 1,000,000 per milliliter.
9. The Grade A milk producer's permit allows (no/limited) addition of water.
10. Both chlorine residues and mineral deposits can be prevented through the use of (acid/alkaline) detergents.
11. Briefly explain the importance of each of the following milking procedures.
 - a. Prewashing dirty teats:
 - b. Milking a few squirts of milk into a strip cup:
 - c. Dipping the teats after milking:
 - d. Milkers keeping their hands clean:
12. Briefly explain two reasons for avoiding the use of hot (140-165F) water for pre-rinsing.
 - a.
 - b.
13. Explain why it is necessary to properly store dairy equipment even though the equipment is sanitized just prior to use.
14. Briefly explain one reason for avoiding overcrowded conditions of dairy equipment and operations in the milking parlor.

UNIT - ADVANCED DAIRY

Lesson 6: Dairy Record and Testing Systems

Objective: Using pedigrees and DHI records, the student will be able to select superior breeding stock.

Study Questions

1. How is data on DHI records interpreted?
2. How does owner sampling differ from official DHI testing?
3. How are pedigrees interpreted?

References

1. Advanced Dairy (Selected Readings). University of Missouri-Columbia: Instructional Materials Laboratory, 1987.
2. Gillespie, James R. Modern Livestock and Poultry Production, 2nd ed. Albany, NY: Delmar, 1983. Unit 40: Management of the Dairy Herd
3. "Dairy Cattle Judging Handbook" (#4002). College Station, Texas: Vocational Instructional Services, Texas A & M University. (optional)

UNIT - ADVANCED DAIRY

Lesson 6: Dairy Record and Testing Systems

TEACHING PROCEDURES

A. Review

Review the previous lesson.

B. Motivation

Studies have proven that dairy herd owners who utilize DHI records have higher average production and income per cow than do herd owners not on a records program.

C. Assignment

D. Supervised study

E. Discussion

1. Ask the students to identify uses for information given on Dairy Herd Improvement (DHI) reports. HO 6.1 has been designed for use with the lesson's evaluation. NOTE: The instructor may request copies of the series, Guide to Using DHI Reports, from the Mid-States Processing Center in Iowa. Sample copies of two DHI reports are in the selected readings. For further information, see the reference listing in the introduction to this unit. Two of the reports are explained below.

How is the data on DHI records interpreted?

- a) Sample Day and Lactation Report (DHIA-200)
 - 1) Section I: The top two lines of the report contain identification and administrative information used by the processing center to keep track of each herd and each report.
 - 2) Section II: Information in this section is used for further identification of each cow.
 - 3) Section III: Information on sample day data indicates the amount of production on the sample day. Data on grain fed and grain needed helps a producer feed cows correctly.
 - 4) Section IV: Providing identification and up-to-date information about the cow's current lactation, the producer can summarize a cow's profitability for her lactation.
 - 5) Section V: The producer is provided with information for making culling and breeding decisions.

- 6) Section VI: Information on a string or the entire herd is given in this section.
- 7) Section VII: Lactations are reported for individual cows when they leave the herd, go dry or when they complete a 305-day or a 365-day record.
- b) Herd Summary Report (DHIA-202): This report can best be used by combining its data with the data on the Sample Day and Lactation Report.
 - 1) Section I: This section summarizes reproductive information about the herd as of the most recent sample day.
 - 2) Section II: The herd summary can be useful in planning with respect to projecting goals, making culling decisions, projecting cash flow, formulating feeding programs, estimating housing needs and grouping animals.
 - 3) Section III: Cow identification, herd sire, service sire, dry days and lactation data provide information helpful in evaluating the herd's genetic progress.
 - 4) Section IV: The birth and inventory summary contains information on offspring born in the last 365 days, any calving difficulty recorded and a record of the number of animals that entered or left the herd since the last report.
 - 5) Section V
 - (a) Stage of lactation summarizes the test-day production of all producing cows.
 - (b) This data can be used to compare the herd's production trend with the average or typical herd.
 - 6) Section VI: The feeding summary contains data on feeds reported fed and on summit milk production, along with some feeding analysis information.
 - 7) Section VII
 - (a) Costs and returns summarize the amount of dollar returns that producers receive in several important management areas.
 - (b) Using a work sheet to determine fixed costs, net dollar return can be determined.
 - (c) It is important to realize that getting better may generate more income than getting bigger.
 - 8) Section VIII
 - (a) Production summary indicates test interval, number of producing animals, test interval daily average and rolling 365-day average.
 - (b) It can be used to identify any sudden drops or rises in production, indicating a need for management changes.
 - 9) Section IX: This area gives information on new or corrected identifications.

2. Ask the student how owner-sampler records are distinguished from official DHI records.

How does owner sampling differ from official DHI testing?

- a) The herd owner weighs and samples milk from each cow and provides these samples, along with other cow data, to the DHI supervisor.
 - b) Records are tabulated and then interpreted in the same way as official DHI records, but since the data is not authenticated by the presence of the DHI supervisor on test day, such records are for private use only.
 - c) Owner-sampler records are not used for performance publicity, sire evaluation or research.
3. Ask the students to identify the important data given on a pedigree. The "Dairy Cattle Judging Handbook" or material from a breed association may be helpful as a student reference.

How are pedigrees interpreted?

- a) Consider production records and type on the cow's pedigree.
 - 1) Determine conditions under which the record was made.
 - (a) Milking twice vs. three times daily
 - (b) 305-day lactation vs. 365-day lactation
 - 2) Determine if the records are actual or adjusted.
 - (a) Pounds of milk and fat actually produced vs. mature equivalent
 - (b) Mature equivalent (M.E.): an estimated figure which predicts what the animal's production will be when mature
 - 3) Determine official type classifications, whether the individual and most of the parents and grandparents were classified and into what category they fall.
NOTE: Point divisions may differ from breed to breed. The following list is for Holstein-Friesian cattle.
 - (a) Excellent: 90 points and above
 - (b) Very good: 85-89 points
 - (c) Good plus: 80-84 points
 - (d) Good: 75-79 points
 - (e) Fair: 70-74 points
- b) Consider predicted difference values on sires.
 - 1) Predicted Difference for Milk (PDM): the amount of milk a given sire's daughter should produce as compared to the average cow
 - 2) Predicted Difference for Fat (PDF): the amount of fat a given sire's daughter should produce as compared to the average cow
 - 3) Predicted Difference for Type (PDT): used to determine how the daughters of a given sire should score, on an official type score classification, compared to the average cow

- 4) Predicted Difference for Income (PD\$): Using PDM and PDF, the dollar amount which daughters of a given sire should generate, as compared to the average individual
- 5) Predicted Difference for Protein (%): used to determine the expected difference in percent protein of milk from a certain bull's daughters as compared to the average
- 6) Percent Repeatability: used to determine how likely the predicted difference will translate into the actual difference

F. Other activities

1. Given a variety of A.I. dairy summaries, have students select appropriate bulls to use with a given set of cows to increase milk and fat production in the offspring.
2. Encourage students to bring in their DHI summaries. Using these summaries, have students identify the bottom 20% of the herd.

G. Conclusion

The wise manager will use the abundance of information given on pedigrees and DHI reports, whether official or unofficial, as guides for making changes to obtain a more efficient and profitable dairy operation. Through careful use of records in managing reproduction, genetics, feeding, costs and returns, a producer can set goals and chart progress for a better dairy production future.

H. Competency

Evaluate the different dairy record and testing systems available.

I. Answers to Evaluation

1. Any three of the following:

- | | |
|---------|------------|
| a) Milk | c) Fat |
| b) Type | d) Dollars |
| | e) Protein |

- | | | |
|-----------|----------------|--------------|
| 2. c | 11. 2 | 19. 54 |
| 3. c | 12. Filda | 20. 4+ |
| 4. Dalisa | 13. Rump, Fuge | 21. 0 |
| 5. 12 | 14. Fe | 22. 14 |
| 6. Red | 15. 3 | 23. 14%, 16% |
| 7. 7 | 16. 2.5 | 24. 4.95 |
| 8. Faye | 17. August | 25. 9-11-86 |
| 9. Fe | 18. No | 26. 7-11-86 |
| 10. 6 | | 27. 2.43 |

Name _____

UNIT - ADVANCED DAIRY

Date _____

Lesson 6: Dairy Record and Testing Systems

EVALUATION

1. List three traits that predicted difference is measured on.

- a.
- b.
- c.

Circle the letter that corresponds to the best answer.

2. Identify the characteristic of owner sampling.

- a. Less information is provided than with official DHI records.
- b. The program cost is higher than official DHI.
- c. Producers take milk samples.
- d. Producers use the information to evaluate young sires.

3. Which defines a 305 M.E. for milk production?

- a. Actual milk and fat produced
- b. Actual milk production corrected for the cow's sire
- c. Milk and fat produced on a corrected basis for age and stage of production
- d. Milk and fat produced on a corrected lifetime basis

Using the producing cows of String 1 on the Sample Day Lactation Report on HO 6.1, fill in the following blanks.

4. Using sample day income over feed cost, which cow is most profitable?

5. How many cows received more grain than they needed? _____

6. Which cow's sample day income over feed cost is poor because of low fat production? _____

7. How many first lactation females are in the string? _____

8. Which cow apparently had the most trouble settling before the current lactation? _____

9. Which cow has been in continuous production for the past 18 months?

10. How many cows have produced less than 4% fat in their lactation to date?

11. How many cows have finished a 305-day lactation? _____
12. Using 305-2X-M.E., which cow will produce the most pounds of fat?

13. Using difference from herdmates figures for milk, which two cows should be culled? _____
14. Which cow had highest percent protein on the sample day? _____

Using the Herd Summary, fill in the blanks for the following.

15. How many cows are open and have been for more than 120 days? _____
16. How many services were required to settle the producing females?

17. During what month will the greatest number of cows be producing milk?

18. Using herd sire P.D.s, has the producer improved the expected producing ability in the youngest calf group? _____
19. How many replacements are sired by bulls without P.D.s? _____
20. Using the lactation summary and a 305-2X-M.E. basis, what age group of cows is producing the most milk? _____
21. How many calves were born dead to cows with 2+ lactations? _____
22. How many cows have been milked more than 200 days? _____
23. What percent protein is needed in the grain mix? _____ How much is provided? _____
24. What was the feed cost per hundredweight of milk on the sample day?

25. On what sample day was the rolling herd average for percent fat highest?

26. On what sample day was the rolling herd average for milk lowest?

27. What was the income over feed cost per cow on the last sample day?

257 STEWARTS GUERNSEY FARM RR 1 BOX 43A MACOMB MO 65702

HERD CODE	BREED	TEST INTERVAL		RECEIVED AT LAB	PROCESSING CENTER		ANALYST	SUPERVISOR	PROTEIN	OPTIONS REQUESTED	RECORD PLAN	LOTTING ORDER				PAGE
		LENGTH	FROM		THRU	SAMPLE DATE						1	2	3	4	
43-98-9245	RG	47	9-12	10-28-86	10-30	10-31	11-04	98	JW	YES	20	DHIR				1

DHIA-200

SAMPLE DAY AND LACTATION REPORT

COMPUTER NUMBER	Breed	SAMPLE DAY DATA						BARN NAME OR NUMBER	LAST DAY	DAYS DRY	FRESHENING DATE	AGE	DAYS	LACTATION TO DATE				COND. ATT. REC.	INCOME OVER FEED COST \$	PERSISTENCY %	305-28 ME		DIFFERENCE FROM HERDMATE		DATE	COW ID
		MILK POUNDS	FAT %	PROT %	INCOME OVER FEED COST \$	GRASS MIX FED	MILK POUNDS							FAT %	PROTEIN %	COND. ATT. REC.	MILK				FAT	MILK	FAT			
43	G	43.5	4.2	3.8	3.50	21	22	FLAKEY	2	57	12-08	3-04	325	16610	4.2	696	3.4	563	1386		16190	660	+5258	+178	1-05	43WB03212
24	G	58.0	4.0	3.6	5.05	21	26	FILDA	2	51	5-28	3-07	154	9650	4.1	394	3.4	324	817	1102	16070	672	+4809	+180	7-06	2851148
131	G	43.5	4.7	4.0	3.72	21	25	GILLEY	1		4-15	2-06	197	9970	4.1	412	3.3	330	791	1023	14720	633	+3452	+137	4-14	2869226
38	G	41.0	4.3	3.6	3.11	21	17	FIRE	2	56	4-12	4-00	200	11060	4.1	448	3.1	344	865	1042	14470	597	+3215	+101	5-03	2838510
121	G	37.0	4.6	4.0	2.86	21	23	GREAT	1		3-21	2-06	222	11020	4.2	458	3.4	376	973	1013	14310	610	+2726	+98	3-16	2869229
9	G	49.0	3.8	3.8	3.86	21	22	LUCKY-7	5	59	6-16	6-10	135	6720	3.8	255	3.2	218	486	1142	13460	537	+2428	+59	6-24	43WAX4982
62	G	55.0	4.7	3.7	5.49	21	23	GORGIOUS	2	42	9-04	3-05	55	2980	4.3	127	3.6	108	258		13230	581	+2007	+102		2861444
64	G	40.0	2.3	3.9	1.69	21	11	RED	5	73	4-29	6-09	183	9760	4.1	396	3.3	323	740	962	13210	495	+1916	-5	6-14	43WAX4981
52	G	29.0	3.8	3.7	1.69	16	8	WHITEY	3	61	3-08	4-07	235	12070	4.1	498	3.3	397	931	952	13360	550	+1752	+35	7-02	43WBC4167
72	G	21.5	6.4	4.8	2.23	11	15	FE	1		5-12	2-07	535	15250	5.5	844	3.9	600	1374		10840	579	+1513	+150	3-06	43WB03213
18	G	39.0	5.3	4.3	3.74	21	21	FLOY	2	50	5-03	3-06	179	8590	5.0	426	3.5	301	784	1092	12660	652	+1277	+160	5-15	2847733
89	G	37.0	4.6	4.0	2.94	21	20	FO	2	64	4-20	4-00	192	9240	4.1	379	3.3	301	695	1052	12470	533	+1163	+34	4-12	43WB02303
13	G	41.0	3.8	3.7	2.91	21	21	FAITH	2	55	7-02	3-08	119	5080	3.9	200	3.4	174	330	1082	11760	467	+457	-18	7-17	2847736
95	G	34.0	4.7	4.0	2.67	21	19	FAMN	3	60	6-17	4-03	134	6610	4.1	272	3.2	214	522	932	11490	514	+364	+36	6-10	2838514
90	G	31.5	4.8	4.0	2.16	21	11	FAYE	2	110	6-05	4-00	146	6740	4.4	295	3.5	234	482	912	11200	514	+47	+36	6-23	2838714
71	G	64.0	4.0	3.1	5.81	21	26	DALISA	5	55	9-17	5-08	42	2460	4.4	108	3.3	82	228	BWT:	1070	10:	002810976			2810976
99	G	37.0	4.3	3.0	2.67	21	16	FANNY	2	68	9-30	4-04	29	930	4.7	44	3.4	32	61	BWT:	1100	10:	43WBL0902			43WBL0902
65	G	63.0	3.3	3.1	4.99	21	24	FIG	3	47	10-20	4-06	9	430	3.5	15	3.5	15	40	BWT:	1000	10:	002836698			2836698
112	G	53.5	3.7	3.6	4.30	21	23	GLORIA	2	51	9-13	3-04	46	2290	4.1	93	3.8	88	184	BWT:	1000	10:	002861910			2861910
167	G	39.5	3.5	3.1	2.65	21	18	MALISA	1		9-25	2-00	34	1150	3.8	44	3.4	39	90	BWT:	820	10:	002868897			2868897
168	G	40.5	3.7	3.0	2.81	21	20	HOCKEY	1		9-18	2-02	41	1470	4.0	59	3.2	47	115	BWT:	950	10:	000000043			43
162	G	52.0	3.1	3.4	3.63	21	21	HOPE	1		10-03	2-04	26	1120	3.4	38	3.8	42	94	BWT:	950	10:	002884090			2884090
82	G	31.0	5.4	3.9	2.84	16	16	FEBUARY	2	61	4-17	4-00	195	8500	4.5	385	3.2	273	661	1042	11110	532	-261	+33	3-19	2838708
147	G	34.0	4.2	4.1	2.36	21	19	GLADA	1		5-28	2-07	154	6100	3.9	237	3.4	205	406	1042	10870	456	-579	-43	5-19	2869224
46	G	32.0	4.8	4.2	2.62	16	16	FLORENE	3	21	4-12	3-07	200	7750	4.8	372	3.7	284	638	1052	10460	508	-938	+6	3-18	2849063
3	G	24.5	5.0	4.1	1.92	11	7	RUMP	3	72	3-19	4-07	224	8590	5.0	430	3.4	295	682	1022	9860	500	-1944	-17	5-11	43WBC8163
55	G	18.0	4.6	3.8	.89	11	4	FUGE	2	74	3-16	3-05	227	8300	4.4	364	3.4	284	551	952	9360	414	-2456	-108	3-03	2849062
STR-ING								% PROT NEEDED			B/WT							% IN MILK								
1		40.3	4.2	3.1	3.15	19	18	14		59	1030	3-09	157					100		1022	12560	550	+1310	+58		
97	G	--	DRY	--	-.37	5	5	CHRISTY	1	50	7-19	2-06							-17		12760	557	+2783	+107	11-06	2865304
96	G	--	DRY	--	-.10	0	1	CHERI	3	56	7-12	5-08							-6		12560	470	+2572	+17	1-18	2794981
11	G	--	DRY	--	-.10	0	2	EDITH	2	11	12-01	4-00							-1		13110	564	+1969	+77	12-05	2838705
1	G	--	DRY	--	-.10	0	1	ADA	7	56	9-10	8-02							-6		12750	502	+1859	+17	1-03	2737199
94	G	--	DRY	--	-.37	5	3	FARAH	1	74	6-21	3-00							-32		11280	552	+1300	+99	10-17	2847734
8	G	--	DRY	--	-.10	0	1	EFFIE	3	28	9-07	4-04							-3		11660	514	+720	+31	12-18	2848447
93	G	--	DRY	--	-.10	0	2	ERA	2	28	7-11	3-06							-3		10390	536	+338	+85	11-24	43WBL0901
171	G	--	DRY	--	-.10	0	2	ANNIE	1		10-23	2-01								BWT:	800	10:	002886915			2886915
2	G	--	DRY	--	-.10	0	2	ERDID	3	44	9-10	4-04							-4		10680	504	-317	+21	11-21	2826396
92	G	--	DRY	--	-.10	0	7	GLISTER	1	28	6-09	2-01							-3		9320	466	-805	+7	11-18	2861913
STR-ING								% PROT NEEDED			B/WT							% IN MILK								
2		0	0	0	-.16	1	3	19		53	1010	4-00									11610	518	+1158	+51		
31	G	59.0	4.3	3.9	5.40	21	28	BAKE	5	53	4-09	7-11	203	11470	4.4	509	3.5	404	1002	1112	16220	736	+5044	+245	7-11	2763483
104	G	67.0	3.2	3.0	5.24	21	26	TENA	9	40	9-02	10-02	51	3390	3.0	99	3.1	103	224		15360	521	+4212	+37		2715775
149	G	39.5	4.4	4.3	3.21	21	20	H-CANE	1		6-04	2-02	147	7230	3.9	285	3.7	264	584	962	14260	598	+3265	+123	5-18	2880166
137	G	41.0	4.4	3.7	2.73	21	19	HOLENE	1		4-22	2-00	190	7940	4.1	325	3.3	264	610	1102	13280	523	+1968	+23	6-15	2880169
127	G	39.0	4.3	3.8	3.17	21	17	GERTUDE	1		4-09	2-04	203	9810	4.0	362	3.3	300	719	1022	13220	548	+1408	+49	4-19	2872902
86	G	39.5	4.7	3.6	3.26	21	20	EUGENA	3	55	5-08	4-05	174	9250	4.2	393	3.2	297	770	1012	13110	591	+1723	+98	4-02	2848440
115	G	34.5	4.5	3.8	3.02	11	15	EMILY	2	13	9-26	3-10	398	14890	4.1	581	3.6	519	989		12220	473	+1339	-12	6-19	2838702

DHI Reports

HO 6.12

UNIT - ADVANCED DAIRY

Lesson 7: Marketing Milk

Objective: The student will evaluate different milk marketing systems.

Study Questions

1. How does a milk cooperative work?
2. What options exist for selling milk?
3. What is the Minnesota-Wisconsin blend pricing system?
4. How is price differential calculated?
5. What is component pricing?
6. How can quality bonuses contribute to dairy income?
7. What are examples of traditional and non-traditional milk products?

References

1. Gillespie, James R. Modern Livestock and Poultry Production, 2nd ed. Albany, NY: Delmar, 1983. Unit 44: Marketing Milk
2. Advanced Dairy (Selected Readings). University of Missouri-Columbia: Instructional Materials Laboratory, 1987.
3. Transparency Master
 - a) TM 7.1: Somatic Cell Count Effects on Production

UNIT - ADVANCED DAIRY

Lesson 7: Marketing Milk

TEACHING PROCEDURES

A. Review

Review the previous lesson.

B. Motivation

Dairy farming is a business--like any other business, the enterprise will fail without a market for the product. Success in dairy farming depends as much on profitable marketing as efficient production.

C. Assignment

D. Supervised study

E. Discussion

1. Ask the student how a milk cooperative operates.

How does a milk cooperative work?

- a) Cooperatives are organizations run by members pooling resources as collective bargaining groups.
 - b) There are two general types of cooperatives.
 - 1) Bargaining associations, which do not handle any milk but make all business arrangements
 - 2) Associations, which process and distribute milk or assemble it for fluid use
 - c) Cooperatives handle about 75% of milk delivered to plants.
 - d) Coop-provided services include the following.
 - 1) Check weights and tests
 - 2) Guarantee a daily market for milk
 - 3) Collect and ensure payment from buyers
 - 4) Provide insurance programs
 - 5) Sell milking supplies and equipment
 - 6) Direct farm-to-market movement of milk
 - 7) Participate in federal order hearings
2. Discuss with the students the various options that exist for selling milk.

What options exist for selling milk?

- a) Cooperatives (about 70-75% of milk sold)
 - 1) Mid-America Dairyman, Inc.
 - 2) Associated Milk Producers, Inc.

- b) Private firms, such as Kraft
 - c) Direct to consumer
3. Ask the students to explain Minnesota-Wisconsin blend pricing.
- What is the Minnesota-Wisconsin blend pricing system?**
- a) The average price paid for manufacturing-grade milk in about 400 Minnesota and Wisconsin plants
 - b) About 50% of the U.S. manufacturing-grade milk produced in Minnesota and Wisconsin
 - c) Price often used as the basis for classified pricing in federal milk marketing orders
4. Ask the students to explain how price differential is calculated.

How is price differential calculated?

- a) Prices received by producers from handlers are adjusted to reflect differences in transportation and milk composition.
 - 1) Location differential: The cost of transporting milk is deducted to determine the price to be paid at the country receiving station or plant.
 - 2) Milkfat differential: Traditional milk pricing has fixed a value for milk containing 3.5% fat, regardless of protein or solids-not-fat (SNF) content.
 - (a) A fat differential is paid for each 0.1% increase in fat content over 3.5% or is subtracted if the test falls below 3.5%.
 - (b) For example, if 3.5% milk is \$12 per cwt and the milkfat differential is 10¢, 4.2% milk would sell for \$12.70 ($\$12.00 + (7 \times 10¢) = \$12.70$).
5. Lead the students in a discussion on the variables of component pricing.

What is component pricing?

- a) Component pricing takes into consideration the value of variations in solids-not-fat, as well as fat.
- b) Milkfat and protein are the two major variable constituents in milk, varying considerably among breeds and herds and depending on the season.
- c) Lactose remains fairly constant at about 5% and minerals at about .7%
- d) Major issues associated with component pricing follow.
 - 1) The value of solids-not-fat has gone up dramatically since 1965; however, producers are frequently paid only on a fat basis.
 - 2) Without component pricing, farmers with a high protein level relative to fat do not get paid for the extra protein.

- 3) Protein can vary between 2.8% and 3.4% for milk from two different herds that both test 3.5% butterfat.
 - 4) Additional protein in milk results in added income due to higher yields of the following products.
 - (a) Skim milk powder
 - (b) Cheese
 - (c) Other high-protein dairy products
 - 5) Consumers are protein-conscious, and milk and dairy products provide consumers with relatively low-cost protein.
6. Ask students how dairy income can be affected by quality bonuses. Show TM 7.1 and refer them to the selected readings.

How can quality bonuses contribute to dairy income?

- a) Milk producers benefit directly and indirectly for their production of quality milk.
 - b) Direct: The cheese yield increases as somatic cell count decreases; therefore, many companies offer varying premiums to producers of milk with the following quality factors.
 - 1) Low somatic cell count: minimum standards vary
 - 2) Low standard plate count (bacteria): minimum standards vary
 - 3) No antibiotics
 - 4) No added water
 - 5) Low sediment
 - c) Indirect: A study has shown producers with high somatic cell counts can lose 20% of their potential milk production.
7. Have the students list examples of traditional and non-traditional milk products and ask them how these products will affect the demand for milk. NOTE: Additional information on non-traditional products is given in the selected readings.

What are examples of traditional and non-traditional milk products?

- a) Traditional
 - 1) Cream
 - 2) Butter
 - 3) Cheese
 - 4) Fluid milk
 - 5) Ice cream
 - 6) Buttermilk
 - 7) Sour cream
 - 8) Yogurt
- b) Non-traditional
 - 1) Carbonated milk
 - 2) High-calcium milk
 - 3) Spreadable butter
 - 4) Ultra high-temperature processed milk

F. Other activities

1. Invite the manager of an area cooperative to discuss the advantages of a coop with the class.
2. Have students research the different milk buyers and have them evaluate quality incentive programs, the price differential paid and whether component pricing is used.

G. Conclusion

The marketing of milk and milk products is a big business. Larger cooperatives have resulted in greater bargaining power for the producer. The time-honored method of pricing milk on butterfat is giving way to pricing based both on fat and solids-not-fat, due to increasing consumption of cheese and skim milk powder. Producers of high-quality milk are being rewarded by dollar incentives and the increased production of their herd. Finally, research, advertising and promotion of milk and milk products is being conducted by organizations such as the United Dairy Industry Association to expand markets and increase demand for dairy foods.

H. Competency

Plan a profitable milk marketing system.

I. Answers to Evaluation

- | | |
|---|--|
| 1. c | 4. a |
| 2. d | 5. b |
| 3. b | 6. Transporting milk from the producer to the plant |
| 7. a) \$12.40
b) \$10.72 | |
| 8. a) Cooperatives
b) Private firms
c) Direct to consumer | |
| 9. a) Actual dollar premiums
b) Increased milk production | |
| 10. Any four of the following:
a) Fluid milk
b) Butter
c) Cheese | d) Cream
e) Ice cream
f) Buttermilk
g) Yogurt |
| 11. Any two of the following:
a) Carbonated milk
b) High-calcium milk | c) Spreadable butter
d) Ultra high-temperature processed milk |

UNIT - ADVANCED DAIRY

Lesson 7: Marketing Milk

Name _____

Date _____

EVALUATION

Circle the letter that corresponds to the best answer.

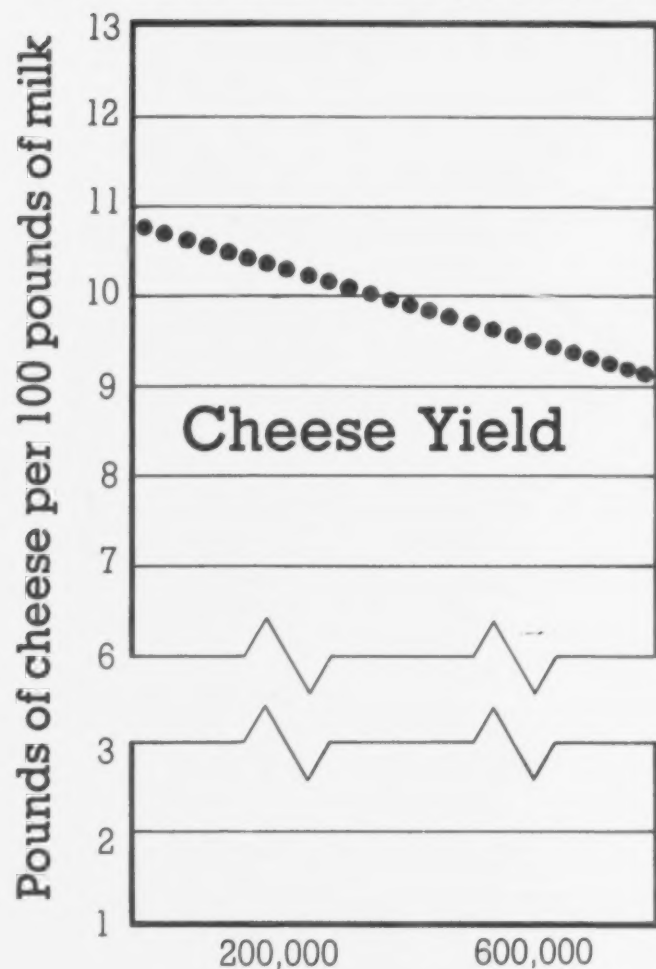
1. The amount of producers' milk handled by cooperatives totals approximately ____ %.
 - a. 55
 - b. 60
 - c. 75
 - d. 90
2. Which service(s) result from a cooperatives' action?
 - a. Guaranteeing daily market for milk
 - b. Participating in federal milk market order hearings
 - c. Collecting and ensuring payment from buyers
 - d. All of the above
3. Minnesota-Wisconsin blend pricing is based on the average price for what grade of milk?
 - a. Fluid milk
 - b. Manufacturing milk
 - c. Combination of fluid and manufacturing
 - d. None of the above: price not based on an average price
4. Component pricing advocates milk pricing based on percent _____.
 - a. Fat and solids-not-fat
 - b. Butterfat
 - c. Water
 - d. Somatic cell count
5. Additional protein results in higher yields of _____.
 - a. Fluid milk
 - b. Cheese
 - c. Ice cream
 - d. Butter

Fill in the blank with the best answer.

6. Location differential reflects the cost of what?
7. If 3.5% milk is \$11.00 per cwt and the milkfat differential is 14¢ . . .
 - a. Milk testing 4.5% would sell for _____ per cwt.
 - b. Milk testing 3.3% would sell for _____ per cwt.
8. Name three options for selling milk.
 - a.
 - b.
 - c.
9. How do producers benefit by producing milk with low somatic cell counts?
 - a. Directly:
 - b. Indirectly:
10. List four traditional dairy products.
 - a.
 - b.
 - c.
 - d.
11. List two non-traditional dairy products.
 - a.
 - b.

Somatic Cell Count Effects on Production

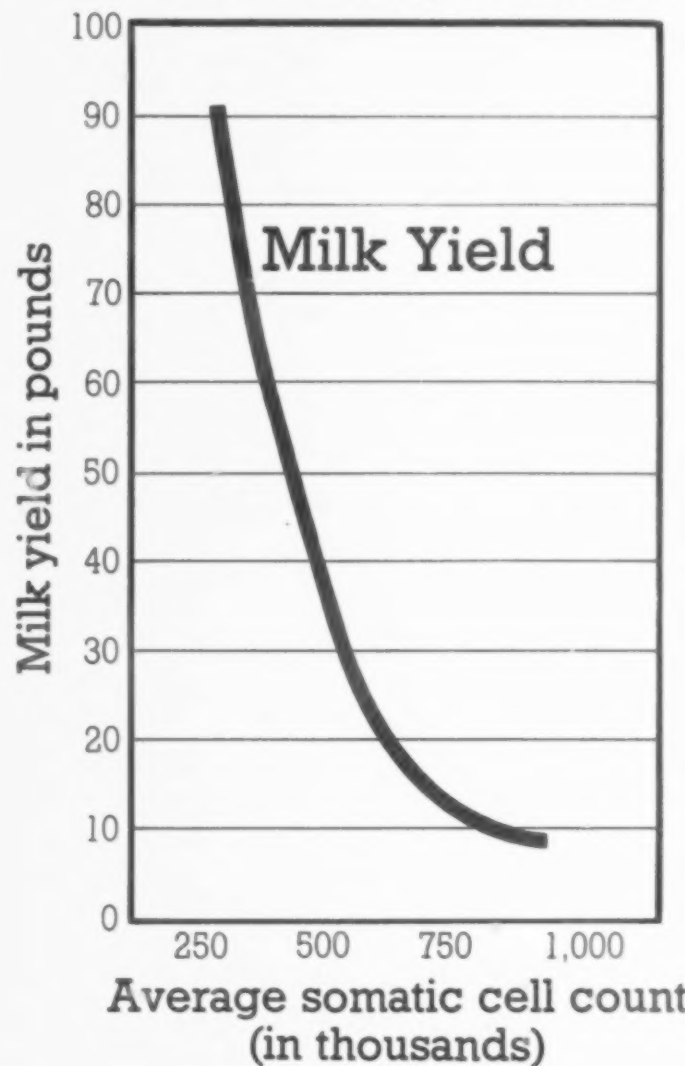
Cheddar cheese yield



Somatic cell count

Credit: "Rise and Shine With Us." Baraboo, Wisc.: Wisconsin Dairies Cooperative, 1984.

Production per cow*



Average somatic cell count (in thousands)

*DHI program - 56,595 cows

UNIT - ADVANCED DAIRY

Lesson 8: Marketing Dairy Replacements

Objective: The student will evaluate marketing options for dairy replacements.

Study Questions

1. How are dairy replacement animals sold?
2. What records are kept for dairy replacement animals?
3. What are the advantages and disadvantages of using registered vs. grade dairy animals?
4. How can advertising and promotion be of value in marketing dairy animals?

References

1. Advanced Dairy (Selected Readings). University of Missouri-Columbia: Instructional Materials Laboratory, 1987.

UNIT - ADVANCED DAIRY

Lesson 8: Marketing Dairy Replacements

TEACHING PROCEDURES

A. Review

Review the previous lesson.

B. Motivation

Some dairy producers have gained nationwide notoriety and wealth from the sales of quality replacements. Have students name some local, well-known producers and explain how they have made themselves known.

C. Assignment

D. Supervised study

E. Discussion

1. Ask the students to identify different methods of marketing replacements.

How are dairy replacement animals sold?

- a) Public auctions: Many local auction barns have special weekly or monthly dairy sales at which breeding stock is marketed.
 - b) Private auctions (farm auctions): Certain producers with adequate numbers of livestock to market have auctions on their farms.
 - c) Breed association sales: Producers of registered breeding stock with limited numbers to market use this option.
 - d) Private treaty: Producers use newspapers, breed journals or word-of-mouth for advertisement, setting their own prices and guarantees.
2. Lead the students in a discussion of the records that are kept for dairy replacements.

What records are kept for dairy replacement animals?

- a) Maintain DHIR or DHI records on the herd.
- b) Have individual animals in the herd classified by the official classifying personnel of the breed association.
- c) Keep recorded pedigrees of all purebred breeding stock in the herd.
- d) Keep pedigree information up-to-date for grade animals.

- e) Test the herd regularly for tuberculosis, leptospirosis and brucellosis.
 - f) Keep individuals identified.
 - 1) Neck chains
 - 2) Numbered ear tags
 - 3) Brands
 - 4) Leg bands
 - g) Maintain a file of photographs of the individuals in the herd.
3. Ask the students if it is more profitable to own registered as opposed to grade dairy animals. NOTE: Any animal not having registration papers is considered to be grade, even though it may be a purebred.

What are the advantages and disadvantages of using registered vs. grade dairy animals?

- a) Advantages of registered stock
 - 1) Known ancestry: Selection can in part be based on the known production records of past generations.
 - 2) Expanded markets: Breed association sales are limited to registered stock only.
 - 3) Production of breeding stock: Sales of registered bulls for use in commercial herds and of heifers to 4-H and FFA members can generate income.
 - b) Disadvantages of registered stock
 - 1) Higher production costs
 - (a) Registration fees
 - (b) Increased cost of breeding stock
 - 2) Increased time need for promotions and recordkeeping
 - c) Advantage of grade stock: reduced investment because of availability and quantity
 - d) Disadvantages of grade stock
 - 1) Lower producing breeding stock: Offspring of cross-bred cows usually don't perform at the same level of production as their parents.
 - 2) Reduced value of breeding stock: While advantageous when purchasing, the lesser value is a disadvantage when selling stock.
 - 3) Unknown ancestry and genetic potential
4. Ask the students to explain how advertising can help make the dairy enterprise profitable.

How can advertising and promotion be of value in marketing dairy animals?

- a) Road signs
 - 1) Advertise breeds produced and breeding stock for sale
 - 2) A cheap yet effective way to reach local producers

- b) Newspapers and breed journals
 - 1) Advertise animals or groups of animals to be sold
 - 2) More expensive but reaches many more people nationwide
- c) Exhibition of select stock
 - 1) County, state and national shows and fairs can be excellent promotions of the quality of stock being produced and sold.
 - 2) Personal contact can be made with producers interested in purchasing stock.
- d) Sponsored field days or judging contests
 - 1) Local 4-H and FFA groups benefit from instruction.
 - 2) Students become aware of producers' stock.
 - 3) Students participating in field days may be encouraged to come back and select breeding stock when they become producers.

F. Other activities

- 1. Have students compare local markets for dairy replacements and determine which market would be most suitable for a given quality or type of replacement.
- 2. Given a variety of breed journals and periodicals, have students appraise advertisements and then determine which are most effective and why.

G. Conclusion

There are a wide variety of markets in which to sell or purchase dairy replacements. Records such as DHIR and vaccination records can be very valuable when marketing breeding stock. Depending upon the individual program, registered may be worth more than grade cattle. Regardless of registration, quality advertisement of the breed and replacement stock can contribute extra income to the dairy operation.

H. Competency

Develop a marketing system for replacement animals.

I. Answers to Evaluation

- 1. b
- 2. d
- 3. a
- 4. c
- 5. d
- 6. Any four of the following:
 - a) Maintain DHIR or DHI records on the herd.
 - b) Have individual animals classified by the breed association.
 - c) Keep pedigrees for all purebred breeding stock.
 - d) Keep pedigree information up-to-date on grade animals.

- e) Test herd regularly for TB, leptospirosis and brucellosis.
 - f) Keep individuals identified.
 - g) Maintain a file of photographs on individuals in the herd.
-
- 7. d
 - 8. a
 - 9. d
 - 10. Newspapers or breed journals
 - 11. Exhibiting at shows and fairs
 - 12. Road signs

UNIT - ADVANCED DAIRY

Name _____

Date _____

Lesson 8: Marketing Dairy Replacements

EVALUATION

Match the type of market on the right with the definition on the left.

- | | | |
|-------------|---|---------------------------------|
| 1. _____ | Located on the producer's farm | a. Public auctions |
| 2. _____ | Only registered replacements sold | b. Private auctions |
| 3. _____ | Auctions held on a regular schedule,
i.e., weekly | c. Private treaty |
| 4. _____ | Owner has greatest control over price
received | d. Breed association
sales |
| 5. _____ | Require select, high-quality replace-
ments | |
| 6. | List four types of records that should be kept on replacements. | |
| | a. | |
| | b. | |
| | c. | |
| | d. | |

Circle the letter that corresponds to the best answer.

7. Which is an advantage of using registered stock?
- a. Registered animals require less time for recordkeeping.
 - b. Milk production is higher due to hybrid vigor.
 - c. The majority of breeding bulls produced will be sold to registered cattle producers.
 - d. Expanded markets are available for breeding cattle.
8. Which is a disadvantage of using registered stock?
- a. Cost of registration
 - b. Increased value of breeding stock sold
 - c. Low investment in breeding stock
 - d. Females produced and sold to 4-H and FFA members

9. Which of the following is an advantage of sponsoring a field day or judging contest?

- a. Youth groups benefit from instruction.
- b. Students become aware of producer's stock.
- c. Future sales can be made to youth participating in field day.
- d. All of the above

Fill in the blank with the best answer.

- 10. Nationwide contact can be made with potential buyers of breeding stock using _____.
- 11. The quality of a breeder's stock can be compared to other breeders' stock by _____.
- 12. A cheap yet effective way of telling local buyers about the breed a farm produces is _____.

UNIT - ADVANCED DAIRY

Lesson 9: Local, State and Federal Regulations for Dairy

Objective: The student will describe local, state and federal regulations as they apply to the production of Grade A raw milk.

Study Questions

1. What are the government health regulations for consumable milk?
2. What are the animal health regulations for consumable milk?
3. What takes place during a farm inspection?
4. What tests are used on milk at the processing plant?
5. What regulations control waste management?

References

1. Gillespie, James R. Modern Livestock and Poultry Production, 2nd ed. Albany, NY: Delmar, 1983. Unit 44: Marketing Milk
2. Advanced Dairy (Selected Readings). University of Missouri-Columbia: Instructional Materials Laboratory, 1987.

ADVANCED DAIRY

Lesson 9: Local, State and Federal Regulations for Dairy

TEACHING PROCEDURES

A. Review

Review Lesson 7: Marketing Milk.

B. Motivation

Years of planned breeding programs and thousands of dollars spent on feeding programs designed to increase production and profits can literally be washed down the drain with a tank full of milk contaminated by high levels of bacteria or antibiotics.

C. Assignment

D. Supervised study

E. Discussion

1. Ask the students to list health regulations for consumable milk. NOTE: The student reference, Modern Livestock and Poultry Production, gives dated 1965 Grade A Pasteurized Milk Ordinance (PMO) regulations; this lesson uses 1978 PMO standards.

What are the government health regulations for consumable milk?

- a) Temperature
 - 1) Cooled to 45F or less within two hours after milking
 - 2) Blended temperature maximum 50F
 - b) Bacterial limits (count per milliliter)
 - 1) Individual producer's milk not to exceed 100,000 prior to commingling with other producers' milk
 - 2) Commingled milk not to exceed 300,000 prior to pasteurization
 - c) Somatic cell count: Not to exceed 1,000,000
 - d) Antibiotics: None detectable
2. Ask students to list health regulations for animals producing fluid milk. NOTE: Contact the Missouri State Veterinarian's Office, Jefferson City, for further explanations of tuberculosis and brucellosis classifications.

What are the animal health regulations for consumable milk?

- a) All milk for pasteurization shall be from herds in Modified Accredited Tuberculosis Areas (as determined by the USDA),

- shall be accredited tuberculosis-free or have passed an annual tuberculosis test.
- b) All milk for pasteurization shall be from herds under a brucellosis eradication program which meets one of the following conditions.
 - 1) Located in a Certified Brucellosis-Free Area as defined by the USDA and enrolled in the testing program
 - 2) Located in a Modified Certified Brucellosis Area and enrolled in the testing program
 - 3) Meet USDA requirements for an individually certified herd
 - 4) Participate in a milk ring testing program with individual blood tests done on all animals showing suspicious reactions to the milk ring test
 - 5) Have an individual blood agglutination test done annually
 - c) For diseases other than brucellosis and tuberculosis, the regulatory agency shall require such physical, chemical or bacteriological tests as it deems necessary.
3. Ask students how they would prepare for a farm inspection. See the selected readings for a sample inspection report.

What takes place during a farm inspection?

- a) State requirements coinciding with federal PMO
 - 1) Each dairy farm shall be inspected by the regulatory agency prior to the issuance of a permit.
 - 2) Following issuance of a permit, dairy farms shall be inspected at least once every six months.
 - 3) Should a violation occur, a second inspection shall be conducted to determine compliance with requirements.
 - 4) Non-compliance of requirements can result in loss of permit to produce and sell Grade A milk.
 - b) Areas to be inspected
 - 1) Cows
 - 2) Milking barn, stable or parlor
 - 3) Milkhouse or room
 - 4) Toilet and water supply
 - 5) Utensils and equipment
 - 6) Milking
 - 7) Personnel
 - 8) Cooling
 - 9) Vehicles
 - 10) Insects and rodents
4. Have the students discuss those tests done on milk at the processing plant.

What tests are used on milk at the processing plant?

- a) Acidity test
 - 1) This test measures the amount of lactic acid in milk.
 - 2) As spoilage in milk occurs, lactic acid is formed.
- b) Standard plate count: used to determine the number of somatic cells present in milk
- c) Butterfat test
 - 1) This test verifies the percent of butterfat in milk against the percent paid to the producer.
 - 2) Percent butterfat must be known when producing certain products, such as whole milk or cheese.
- d) Cryoscope: measures the water content of milk
- e) Antibiotics test
- f) Phosphatase test: performed on pasteurized milk to determine if improper pasteurization has occurred

5. Ask the students to list waste regulations applicable to a dairy operation.

What regulations control waste management?

- a) State regulations, following federal PMO, provide sanitation requirements for dairy farms under the same section which lists health requirements for fluid milk.
- b) Actual regulations include the following.
 - 1) Cow yard shall be graded and drained with no standing pools of water or accumulations of organic waste.
 - 2) Cow droppings and soiled bedding shall be removed from loafing areas to prevent soiling of cow's udder and flanks.
 - 3) Wasted feed shall not be allowed to accumulate.
 - 4) Manure will be stored inaccessible to cows.

F. Other activities

- 1. Invite a local dairy farm inspector to class to discuss inspection procedures with students. Have them detail some common violations and outline a program to maintain the producer's permit.
- 2. Invite the manager of a local processing plant to discuss fluid milk health regulations and describe the processing of milk once it reaches the plant.

G. Conclusion

The production of clean, unadulterated fluid milk must be of utmost concern to the dairyman. Not only is the health of the general public at stake, but the financial welfare of the producer is, as well. Government agencies set up standards by which each producer's milk must be graded. Federal inspectors police farms and processing plants to ensure the production of a clean, wholesome product.

H. Competency

Identify local, state and federal regulations as they apply to dairy production.

I. Answers to Evaluation

1. d
2. b
3. a
4. a
5. Milk ring test
6. Tuberculosis
7. At least once every six months
8. Water content of milk
9. Spoilage of milk
10. Loss of permit to produce Grade A milk

UNIT - ADVANCED DAIRY

Lesson 10: Matching Production to Marketing

Objective: The student will design a plan of production practices to match marketing strategies.

Study Questions

1. When are cows bred to achieve highest possible income?
2. Why should cows be palpated?
3. What culling criteria are used with dairy animals?
4. What factors are considered when deciding to sell or keep dairy calves?
5. How is milk production affected by quality and quantity bonuses?

References

1. Gillespie, James R. Modern Livestock and Poultry Production, 2nd ed. Albany, NY: Delmar, 1983. Unit 40: Management of the Dairy Herd
2. Advanced Dairy (Selected Readings). University of Missouri-Columbia: Instructional Materials Laboratory, 1987.

Name _____

UNIT - ADVANCED DAIRY

Date _____

Lesson 9: Local, State and Federal Regulations for Dairy

EVALUATION

Circle the letter that corresponds to the best answer.

1. Which of the following is a government requirement for farmers selling fluid milk?
 - a. Cool milk to 35F or less within 45 minutes after milking
 - b. Have less than 35,000 bacteria count per milliliter
 - c. Have a negative phosphatase test
 - d. Have a somatic cell count of not more than 1,000,000 per milliliter
2. Which is covered on a dairy farm inspection report?
 - a. Pets
 - b. Personnel
 - c. Feed-handling equipment
 - d. Pastures
3. Which of the following is a waste management regulation?
 - a. Manure stored inaccessible to cows
 - b. Standing water allowed, but no accumulation of organic waste
 - c. Accumulation of wasted feed not to exceed two weeks
 - d. Manure removed from pasture areas where cows frequently rest
4. The acceptable level of antibiotic in a producer's milk is _____.
 - a. None detectable
 - b. .05 parts per million
 - c. 1.0 part per million
 - d. 100,000 parts per milliliter

Fill in the blank with the best answer.

5. Cows with brucellosis can be detected from milk samples taken using a test called the _____.
6. A disease which dairy cows should be tested for other than brucellosis is _____.
7. Dairy farms should be inspected how often? _____

8. The cryoscope test measures _____ .
9. An acidity test determines _____ .
10. Non-compliance of dairy inspection requirements can result in _____
_____ .

UNIT - ADVANCED DAIRY

Lesson 10: Matching Production to Marketing

TEACHING PROCEDURES

A. Review

In preparation for this lesson, review Lesson 6, Dairy Record and Testing Systems, and Lesson 7, Marketing Milk.

B. Motivation

Just as department stores don't stock shelves full of swimsuits in December, but in May, dairy producers must match production to market demand. Furthermore, they must be efficient in production if they are to maintain profit while selling a reasonably priced product to the consumer.

C. Assignment

D. Supervised study

E. Discussion

1. Question the students as to when cows should freshen to achieve highest possible income.

When are cows bred to achieve highest possible income?

- a) Milk production peaks are usually more seasonal than consumption demands.
 - 1) Grade A milk surpluses usually occur in the spring and early summer.
 - 2) The greatest utilization of Grade A supplies occurs in the fall and winter.
- b) Many milk processors use a fluid milk formula which should encourage producers to freshen cows in the fall and winter.
 - 1) During periods when fluid milk production exceeds consumption, the excess is used for manufacturing purposes.
 - 2) Prices paid for milk used in manufacturing products are lower than those paid for fluid milk.
 - 3) Producers are paid based on the milk's usage, even though 100% of the milk may qualify as fluid milk.
 - 4) Fall and winter prices are usually the highest per cwt.
- c) Freshening in the fall and winter results in more total milk production per cow.
- d) Select the individual's freshening dates in advance of breed shows and/or sales in which they will participate.

2. Ask the students to discuss reasons for giving cows rectal palpations. See the selected readings for UMC Guide 3011: Reproductive Dairy Herd Health Program--Routine Examinations.

Why should cows be palpated?

- a) To make sure the reproductive tract is free of gross infections prior to rebreeding (cows fresh 25-40 days)
- b) To determine the source of an infection in cows with abnormal discharge
- c) To determine the nature of a hormonal imbalance in cows with abnormal heats and heat cycles
- d) To determine if the cow is cycling normally when not showing heat 45-60 days after calving
- e) To determine cause of breeding difficulty when cows are bred 2-3 times
- f) To determine if cow is pregnant (35-60 days after breeding)
- g) To determine cows still open after 150 days
 - 1) Depending on production level, cull the open cows.
 - 2) Open cows result in an annual loss of income.
 - (a) Loss of milk sales
 - (b) Loss of calf sales
 - (c) Increased dry cow feed cost
 - (d) Added replacement cost
 - (e) Added semen cost

3. Ask the students to list reasons for culling cows.

What culling criteria are used with dairy animals?

- a) Low milk production
 - 1) Negative production compared to herdmates
 - 2) First-calf heifers producing 30% or more below the herd average
 - 3) Mature cows producing 20% or more below herd average
 - 4) Cows producing below cost break-even point
- b) Reproduction problems: those still not bred 150 days after calving
- c) Disease problems: those with repeated health problems
- d) Udder problems
 - 1) Chronic mastitis
 - 2) Poor udders
- e) Miscellaneous reasons
 - 1) Nervous and/or hard to handle
 - 2) Feet and leg problems
 - 3) Low USDA cow index
 - 4) Calves from culled cows

4. Lead the students in a discussion of the factors that influence decisions to sell or keep dairy calves.

What factors are considered when deciding to sell or keep dairy calves?

- a) Available markets/demand (registered vs. grade)
 - b) Cost of raising
 - 1) Feed
 - 2) Facilities
 - 3) Labor
 - c) Genetic potential (PD's, estimated producing ability)
 - d) Market value (present vs. potential)
 - e) Quality of the animal (type, size)
 - f) Sex (heifer or bull)
5. Have students discuss how milk production is affected by quality and quantity bonuses. Review question 6 in Lesson 7 on how quality bonuses affect income. Students may also refer to information in the selected readings for this lesson.

How is milk production affected by quality and quantity bonuses?

- a) Quality bonuses paid for milk with low somatic cell counts
 - 1) Infection caused by mastitis increases somatic cells and is associated with lower milk production.
 - 2) Health programs designed to control mastitis cause increased production and thus lowered somatic cells.
 - 3) Other factors affecting somatic cell count include the following.
 - (a) Late lactation
 - (b) Old age
 - (c) Environmental stress
 - 4) Cull low-producing cows with high cell counts.
 - (a) Improve quality of the producer's milk
 - (b) Increase average milk production per cow
- b) Quantity bonuses paid for pounds of milk picked up at the farm that is above minimum standards
 - 1) Producers can increase production to take advantage of hauling bill discounts for minimum volume pick-up.
 - 2) Plant operators need a minimum volume to reduce average trucking charges.

F. Other activities

Given a dairy milking 65 cows, have the students work the following problems. Use fictional or actual data (if available), including DHIA reports, milk test reports listing SCC, current livestock market summaries, current feed prices and miscellaneous cow information, such as disposition. Have students determine:

- 1. Cows to be culled
- 2. Whether or not young bull and heifer calves will be raised or sold
- 3. How much added income could be gained by reducing SCC

4. Whether the majority of the herd freshens during the fall and winter months

G. Conclusion

The key to profitability is matching quantity and quality of production to market demands. Cows need to freshen during the establishment of the milk base in order to achieve the greatest economic return during the year. Cows should be culled which are low producers, are open for long periods of time and have mastitis, which causes direct and indirect losses of income. Increased farm income can result from the proper evaluation of factors, such as feed cost, market value and genetic potential, which influence the raising of dairy calves. Finally, premiums can be earned for milk which meets established standards for somatic cells, bacteria and water.

H. Competency

Select production practices to match marketing strategies.

I. Answers to Evaluation

1. d
2. d
3. b
4. d
5. Quantity bonuses
6. Mastitis
7. Breed shows and sales
8. Cause of breeding difficulty
9. Any four of the following:
 - a) Available markets/demand
 - b) Cost of raising
 - c) Genetic potential
 - d) Market value
 - e) Quality of animal
 - f) Sex
10. Any three of the following:
 - a) Loss of milk sales
 - b) Loss of calf sales
 - c) Increased dry cow feed cost
 - d) Added replacement cost
 - e) Added semen cost

UNIT - ADVANCED DAIRY

Name _____

Date _____

Lesson 10: Matching Production to Marketing

EVALUATION

Circle the letter that corresponds to the best answer.

1. Which of the following factors affect somatic cell count?
 - a. Stage of lactation
 - b. Age of animal
 - c. Environmental stress
 - d. All of the above
2. Cows should be culled when they _____.
 - a. Have positive production as compared to herd mates
 - b. Are open after 45 days
 - c. Reach a certain age
 - d. Have chronic mastitis
3. Cows should be checked for pregnancy how many days after breeding?
 - a. 20-40
 - b. 35-60
 - c. 60-80
 - d. 100-120
4. Cows should usually freshen during what season to take advantage of the highest priced market?
 - a. Late winter, early spring
 - b. Late summer, early fall
 - c. Late spring, early summer
 - d. Late fall, early winter

Fill in the blank with the best answer.

5. Dollar incentives paid for a volume of milk shipped above the minimum requirements are called _____.
6. The major cause of a high somatic cell count is _____.
7. Producers can freshen certain cows to match dates of _____.
8. Cows that have been bred 2-3 times and are still open should be palpated to determine _____.

9. List four factors to be considered when deciding to sell or keep dairy calves.

- a.
- b.
- c.
- d.

10. List three reasons that open cows cause loss of income.

- a.
- b.
- c.

UNIT - ADVANCED DAIRY

Lesson 11: Government Programs for Dairy

Objective: The student will describe how government programs affect the dairy industry.

Study Questions

1. How is dairy income affected by price supports?
2. What effects have government programs had on milk production?
3. What influence have import/export quotas had on the dairy industry?
4. What is the function of dairy lobbying groups?

References

1. Advanced Dairy (Selected Readings). University of Missouri-Columbia: Instructional Materials Laboratory, 1987.
2. Transparency Master
 - a) TM 11.1: M-W Price Series vs. the Support Price

UNIT - ADVANCED DAIRY

Lesson 11: Government Programs for Dairy

TEACHING PROCEDURES

A. Review

Review the previous lesson.

B. Motivation

The government plays a significant role in the dairy industry. Dairy legislation passed in Washington can have a profound effect on the small, as well as the large, producer. Dairymen are also indirectly affected by government programs regarding grain products and the import/export quotas placed on these commodities.

C. Assignment

D. Supervised study

E. Discussion

1. Discuss with the students how dairy income is affected by price supports. Show TM 11.1 to illustrate how support prices compare to M-W prices over a recent 10-year period.

How is dairy income affected by price supports?

- a) Milk prices received by producers are supported by government purchases of less perishable products.
 - 1) Butter
 - 2) Nonfat dry milk
 - 3) American cheese
 - b) Supports are designed to enable manufacturers to pay farmers the support price during periods of surplus production.
 - c) The price support program benefits producers.
 - 1) Smoothing out price variations
 - 2) Providing a market for milk at an assured price
 - d) Price supports undergird all prices received by dairy farmers.
2. Ask the students to discuss how government programs have affected milk production.

What effects have government programs had on milk production?

- a) Food and Agriculture Act of 1977
 - 1) Raised minimum support level to 80% of parity

- 2) Provided that the support price be updated every six months for the next four years
 - (a) Helped cause a reversal of a 33-year downward trend in cow numbers
 - (b) Guaranteed producers an attractive price
 - (c) Price guaranteed to keep pace with inflation
- b) 1983 dairy diversion program: designed to deal with the product surplus problem
 - 1) Made no lasting changes in milk output
 - 2) No noticeable changes in the manufacturing-processing sector (the most over-expanded sector of the industry)
- c) 1985 whole-herd buyout
 - 1) Removed 12 billion pounds of milk from the market over an 18-month period
 - 2) Participating herds either slaughtered or exported
 - (a) Caused recovery period to be slower
 - (b) Expected to have only a temporary effect
3. Lead the students in a discussion on the impact of import/export quotas on the dairy industry.

What influence have import/export quotas had on the dairy industry?

- a) Import quotas have been established to protect the dairy industry from other countries' dumping of dairy products onto American markets.
 - b) U.S. imports and exports are relatively small: 1.6% and .4%, respectively (in 1976).
 - c) A large portion of U.S. exports are government-owned surplus products sent to developing countries.
4. Ask the students to discuss how lobbying groups affect the dairy industry.

What is the function of dairy lobbying groups?

- a) These groups work to assure that American dairymen have a unified voice that is powerful enough to cause action in the nation's legislative and administrative bodies.
- b) Lobbying groups have been established since the early 1900s and have been instrumental in protecting such legislation as the Copper-Volstead Act, which allows cooperatives to exist.
- c) Lobbying efforts are aimed at maintaining and improving the economic well-being of dairy farmers.

F. Other activities

1. Invite the area dairy extension specialist to explain how the latest government programs will affect local dairies.

2. Invite a representative from the National Milk Producers Federation to explain current lobbying efforts being conducted on behalf of dairy producers. (See the selected readings in Lesson 12 for an address.)

G. Conclusion

The U.S. government has played a significant role in the dairy industry for years, and current legislation would indicate it plans to continue. Although producers are often critical of federal programs, the intent has been to protect and support the dairy farmer. Dairy lobbyists also work within the governmental system to promote and strengthen the industry.

H. Competency

Describe government programs and how they affect the dairy industry.

I. Answers to Evaluation

1. b
2. e
3. f
4. a
5. c
6. f
7. e
8. d
9. c
10. a

Name _____

UNIT - ADVANCED DAIRY

Date _____

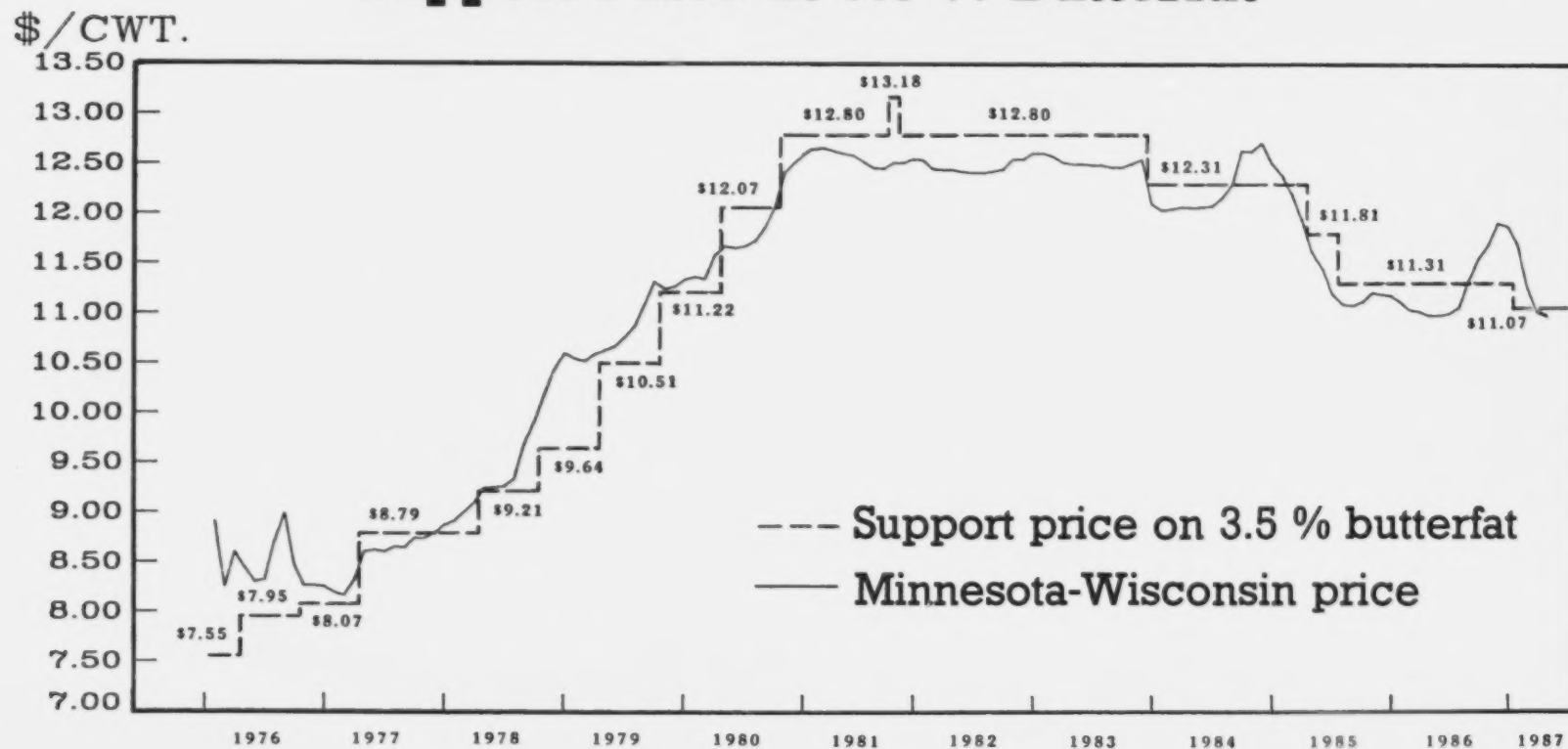
Lesson 11: Government Programs for Dairy

EVALUATION

Match the government policy on the right with the definition on the left.

- | | | |
|---|---|-------------------------------------|
| 1. _____ | Caused very little change in U.S. milk production | a. Import quota |
| 2. _____ | Causes price variations to be smoothed out | b. Diversion program |
| 3. _____ | Caused 12 billion pounds of milk to be removed from the market | c. Food and Agriculture Act of 1977 |
| 4. _____ | Prevents other countries from flooding American markets with dairy products | d. Export quota |
| 5. _____ | Caused a reversal of the downward trend in cow numbers | e. Price support |
| 6. _____ | Caused large numbers of dairy animals to be slaughtered | f. Whole-herd buyout |
| 7. _____ | Maintained by government purchase of butter, cheese and nonfat dry milk | |
| 8. _____ | Usually fulfilled by government-owned surplus sent to developing countries | |
| 9. Lobbying groups have been in existence since the early _____. | | |
| a. | 1960s | |
| b. | 1940s | |
| c. | 1900s | |
| d. | 1800s | |
| 10. Dairy lobbying groups were established to protect which of the following? | | |
| a. | Producer | |
| b. | Consumer | |
| c. | Processor | |
| d. | Government | |

Minnesota - Wisconsin Price Series vs. the Support Price at 3.5 % Butterfat



Credit: USDA information prepared by Milk Market Administrator's Office, Maryland Heights, Missouri.

UNIT - ADVANCED DAIRY

Lesson 12: Dairy Associations and Organizations

Objective: The student will identify and describe the different dairy breed associations and producer organizations.

Study Questions

1. What are the major breed associations?
2. What is the role of breed associations in the dairy industry?
3. How can dairy organizations assist the dairy producer?

References

1. Gillespie, James R. Modern Livestock and Poultry Production, 2nd ed. Albany, NY: Delmar, 1983. Unit 37: Breeds of Dairy Cattle
2. Advanced Dairy (Selected Readings). University of Missouri-Columbia: Instructional Materials Laboratory, 1987.

UNIT - ADVANCED DAIRY

Lesson 12: Dairy Associations and Organizations

TEACHING PROCEDURES

A. Review

Review the previous lesson.

B. Motivation

Each year, dairy farmers contribute thousands of dollars to dairy organizations dedicated to the improvement and expansion of the dairy industry. In 1987 the National Milk Board's calcium print campaign was funded with \$3.85 million. This money came not from taxpayers, but producers.

C. Assignment

D. Supervised study

E. Discussion

1. Ask the students to name the major breed associations. For addresses to these organizations, students may refer to the selected readings.

What are the major breed associations?

- a) Ayrshire Breeders Association
 - b) Brown Swiss Cattle Breeders Association
 - c) American Guernsey Cattle Club
 - d) Holstein-Friesian Association of America
 - e) American Jersey Cattle Club
 - f) American Milking Shorthorn Society
2. Lead the students in a discussion on the roles that breed associations play in the dairy industry.

What is the role of breed associations in the dairy industry?

- a) Communicate information to members and non-members
 - 1) Breed journals
 - 2) Newsletters
 - 3) Breed shows
 - 4) Trade shows
- b) Through genetic improvement, raise the occupation of dairy producer to the profession of cattle breeder
 - 1) Dairy Herd Improvement Registry
 - 2) Performance pedigrees

- 3) Breed recognition programs
 - 4) Sire selection reports
 - 5) Cow family performance summaries
 - 6) Dairy herd management systems
 - 7) Linear classification
 - c) Maintain a record of identification, ancestry and production
 - d) Facilitate merchandising of registered animals through local and international channels
3. Ask the students to list several dairy organizations and how they help the local producer.

How can dairy organizations assist the dairy producer?

- a) Associated Milk Producers, Inc.: cooperative providing services as discussed in Lesson 7
- b) Association of Missouri Dairy Organizations: contributes funds to student groups such as university dairy judging teams (for travel expenses) and high school dairy judging students (as dairy contest awards)
- c) Cattlemen's Beef Promotion and Research Board: administers Check-off funds collected at the sale of dairy and beef animals
 - 1) Research
 - 2) Education
 - 3) Public relations
 - 4) Advertising
 - 5) Foreign market development
- d) Mid-America Dairymen, Inc.: cooperative (refer to Lesson 7)
- e) Missouri Dairy Association
 - 1) Finances dairy research and educational programs designed to help Missouri producers through extension efforts, scholarships and graduate assistantships
 - 2) Collects and distributes information on industry phases such as marketing conditions, efficient production, and milk and dairy products
- f) National Dairy Board (National Dairy Promotion and Research Board): provides market and product research, product advertising and development
- g) National Dairy Council
 - 1) Non-profit organization devoted to nutritional research and education
 - 2) Receives 11¢ of the 15¢ assessed on each cwt of milk sold in the U.S.
- h) National Dairy Herd Improvement Association: programs designed to increase production and profitability of dairy producers
- i) National Mastitis Council
 - 1) Works to enhance the quality of milk and other dairy products
 - 2) Works to increase profitability of dairy farming through improved mastitis control

- j) National Milk Producers Federation
 - 1) Formed in 1916
 - 2) Lobbies in Washington for cooperatives and member producers
- k) Purebred Dairy Cattle Association
 - 1) Includes representatives from each of the six major breed associations
 - 2) Works to improve the dairy industry
- l) United Dairy Industry Association
 - 1) Product advertising and marketing services
 - 2) Nutrition research and education
 - 3) Product and process research and development
 - 4) Marketing and economic research
 - 5) Communications and public relations
 - 6) Industry and member relations

F. Other activities

- 1. Assign each student a dairy organization or breed association. Have students gather information to present an oral report on the company's purpose and services provided to producers. The student may contact the organization using addresses in the selected readings.
- 2. Invite breed association representatives to speak to the class on the purpose of the association and the services they provide to members.

G. Conclusion

Breed associations and dairy organizations play a vital role in the dairy industry. With relatively small contributions by individual producers, the industry as a whole has benefitted tremendously because of improved animal health, marketing, product research and promotion.

H. Competency

Identify the different dairy associations and organizations.

I. Answers to Evaluation

- 1. d
- 2. b
- 3. a
- 4. d
- 5. e
- 6. c
- 7. d
- 8. c
- 9. b

10. a) Ayrshire
b) Brown Swiss
c) Guernsey
d) Holstein
e) Jersey
f) Milking Shorthorn

Name _____

UNIT - ADVANCED DAIRY

Date _____

Lesson 12: Dairy Associations and Organizations

EVALUATION

Match the dairy organization on the right with the function performed on the left. (Some organizations have more than one function listed.)

- | | | |
|-----------|---|--|
| 1. ___ | Provide sire performance summaries | a. Milk cooperatives |
| 2. ___ | Promote meat products | b. Cattlemen's Promotion & Research Board |
| 3. ___ | Directly assist producers in marketing milk | c. National Dairy Council |
| 4. ___ | Aid in merchandising registered animals | d. Breed associations |
| 5. ___ | Conduct research on mastitis control | e. National Mastitis Council |
| 6. ___ | Educate public about dairy products | |
| 7. ___ | Offer type classification services | |
| 8. ___ | Conduct research on new dairy products | |
| 9. ___ | Provide public nutritional information on beef | |
| 10. | List the six dairy breeds represented by a major association. | |
| | a. | |
| | b. | |
| | c. | |
| | d. | |
| | e. | |
| | f. | |

UNIT - ADVANCED DAIRY

Lesson 13: Selecting Breeding Animals

Objective: The student will select breeding animals that will increase the productivity of the dairy herd.

Study Questions

1. What information is used to develop a cow index?
2. What cow indexes are considered in selecting dairy replacements?
3. What four major areas are evaluated in visual selection of dairy cows?
4. What are the advantages of linear classification for dairy cows?
5. How is a dairy sire selected for artificial insemination?

References

1. Advanced Dairy (Selected Readings). University of Missouri-Columbia: Instructional Materials Laboratory, 1987.
2. Campbell, John R.; Robert T. Marshall. The Science of Providing Milk for Man. New York: McGraw-Hill Book Co., 1975. (optional)
3. Hartman, Dennis A. Techniques of Judging Dairy Cattle (IML #AG-85-S). Blacksburg, Va., 1979.
4. "Dairy Cattle Judging" slides (IML #AG-1102-V). Stephenville, Texas: Tarleton State University, 1984.
5. Dairy Cattle Judging Handbook (IML #AG-1101-S). College Station, Texas: Vocational Instructional Services, Texas A&M University.
6. Breed association information (optional)

UNIT - ADVANCED DAIRY

Lesson 13: Selecting Breeding Animals

TEACHING PROCEDURES

A. Review

Review the previous lesson.

B. Motivation

"Creation lies at the base of the world's entire civilization . . . to breed good dairy cattle is to create, and, when done in full recognition of economic requirements, is profitable. Animals of superior heredity were sought by the earliest breeders. And they will be sought by future generations."

--Karl B. Musser

Science of Providing Milk for Man
by Campbell and Marshall, 1975

C. Assignment

D. Supervised study

E. Discussion

1. Ask the students to list the information included in a cow index.

What information is used to develop a cow index?

- a) Production records
 - 1) Individual
 - 2) Dam
 - 3) Individual's daughters
 - 4) Paternal half siblings
 - 5) Maternal half siblings
 - 6) Herdmates
- b) Sire's predicted difference (PD)
- c) Lactation information
 - 1) Days in current lactation
 - 2) Number completed
 - 3) Number of milkings per day
 - 4) Age at calving
 - 5) Month of calving

2. Lead the students in a discussion about the use of cow indexes.

What cow indexes are considered in selecting dairy replacements?

- a) Estimated Average Transmitting Ability (EATA)
 - 1) An estimate of the breeding value a cow will transmit

- to her offspring
 - 2) Provides breeders a fair, unbiased, comparatively accurate appraisal of the breeding worth of the individual
 - 3) Similar to P.D. for dairy sires
 - b) USDA cow index
 - 1) An estimate of a cow's genetic transmitting ability
 - 2) Computer calculations required
 - (a) Complicated formulas
 - (b) Large amount of information used to calculate index
 - 3) Purposes
 - (a) Used extensively for selection of superior dams to produce A.I. sires
 - (b) Purchasing replacements
 - (c) Culling
 - (d) Aids in marketing breeding stock
3. Ask the students to list the four major areas in visual evaluation and to name some specific characteristics found in each. (The reference used in developing this section was the Purebred Dairy Cattle Association's Unified Dairy Cow Score Card.)

What four major areas are evaluated in visual selection of dairy cows?

- a) General appearance (35 pts.)
 - 1) Breed characteristics
 - 2) Head
 - 3) Shoulder blades
 - 4) Back
 - 5) Rump
 - 6) Legs and feet
 - b) Dairy character (20 pts.)
 - 1) Neck
 - 2) Withers
 - c) Body capacity (10 pts.)
 - 1) Barrel
 - 2) Heart girth
 - d) Mammary system (35 pts.)
 - 1) Udder
 - 2) Fore udder
 - 3) Rear udder
 - 4) Teats
 - 5) Mammary veins
4. Have the students discuss the benefits of using linear classification.

What are the advantages of linear classification for dairy cows?

- a) Allows for improved sire selection and mating practices
 - 1) Improved production
 - 2) Reduced number of herd replacements
 - 3) Improved animal durability
 - 4) Increased number of lactations per animal
 - 5) More real profits
 - b) Measures descriptive functional traits precisely and uniformly
 - 1) Does not judge desirability of trait
 - 2) Measures only biological differences
 - c) Evaluates traits known to have economic value and heritable importance
 - 1) Form
 - (a) Stature
 - (b) Strength
 - (c) Body depth
 - (d) Angularity
 - 2) Rump
 - (a) Angle
 - (b) Rump length
 - (c) Rump width
 - 3) Legs and feet: side view of rear legs
 - 4) Udder
 - (a) Fore attachment
 - (b) Rear height
 - (c) Rear width
 - (d) Support
 - (e) Depth
 - 5) Teat placement
 - d) Provides an opportunity for research
 - 1) Secondary traits are measured and studied to determine economic importance, i.e., relative height of front end.
 - 2) Certain management traits are included in the classification program to determine the relationship to an animal's herd life.
 - e) Designates a final classification score
 - 1) Final score is determined by rating the four major areas.
 - 2) Linear measurements do not directly relate to the final score.
5. Ask the students to discuss criteria used to select a sire to use for artificial insemination.

How is a dairy sire selected for artificial insemination?

- a) Production of A.I. sires by planned mating
 - 1) Identify superior cows.
 - (a) 4,000+ pounds milk above herdmates

- (b) Half-siblings producing 2,000-3,000+ pounds above herdmates
 - (c) Cow families noted
 - (1) Desirable conformation type
 - (2) Longevity
 - (3) Good temperament
 - (4) Reproductive efficiency
- 2) Mate cow with superior A.I. stud for high P.D. and high repeatability.
- 3) Semen collection begins at 10-12 months of age.
- 4) In herds throughout the U.S., enough cows are mated with the young bull to obtain 50-100 production tested daughters.
- 5) Bull is placed "on the shelf" for 4-6 years until daughters mature and provide milk production records.
- 6) Bulls with high P.D.s are distributed for widespread use.
- b) Selection of dairy sires using sire indexes
 - 1) Daughter average: selection based on the average production of the sire's daughters
 - 2) Daughter-dam difference: considers the amount of increase or decrease in milk produced by a bull's daughters, as compared to their dams
 - 3) Equal-parent index
 - (a) Based on the premise that the sire and dam contribute equally to the inherent milk-producing ability of the progeny
 - (b) $\text{Sire index} = 2 \times (\text{ave. production of daughters}) - (\text{ave. production of dams})$
 - 4) Daughter-contemporary herd difference
 - (a) Substitutes herd average for dam's average production in daughter-dam difference index
 - (b) $\text{Sire index} = \text{daughter's ave.} - \text{herd ave.}$
 - 5) Daughter-contemporary herd index
 - (a) Substitutes herd average for the dam's average production in the equal parent index
 - (b) $\text{Sire index} = 2 \times (\text{ave. production of daughters}) - \text{herd ave.}$
 - 6) Herdmate comparison
 - (a) Sire's daughters compared with cows (herdmates) that freshen in the same herd during the same season of the same year
 - (b) Removes most environmental differences, such as season of calving
 - 7) Adjusted herdmate average: each lactation of a sire's daughter adjusted for comparison with one another.

F. Other activities

1. Plan a field trip to the farm of a local producer of registered stock to coincide with the official type classification scoring by a breed representative.

2. Have students evaluate a number of dairy cows by using the dairy cow unified score card, explaining the reasons for their evaluations.

G. Conclusion

The livestock that is selected and used for production becomes the foundation for the dairy enterprise. Incorporating tools such as cow indexes, performance evaluations and type evaluations should only serve to strengthen the dairy program. Sire selection is of vital importance if the breeder is to make genetic improvement within the herd. Many breed associations and dairy organizations provide cow and sire evaluations which further aid in the process of producing superior breeding stock.

H. Competency

Select breeding animals that will increase the productivity of the dairy herd.

I. Answers to Evaluation

- | | |
|------|-------|
| 1. d | 9. e |
| 2. a | 10. b |
| 3. b | 11. a |
| 4. b | 12. d |
| 5. b | 13. c |
| 6. a | 14. d |
| 7. c | 15. b |
| 8. a | 16. d |
| | 17. b |

18. a) General appearance
b) Dairy character
c) Body capacity
d) Mammary system

19. Any four of the following:
a) Dam
b) Daughters
c) Paternal half siblings
d) Maternal half siblings
e) Herdmates

UNIT - ADVANCED DAIRY

Name _____

Date _____

Lesson 13: Selecting Breeding Animals

EVALUATION

Circle the letter that corresponds to the best answer.

1. Which of the following is not a purpose of the USDA cow index?
 - a. Aid in marketing breeding stock
 - b. Selecting dams to produce A.I. studs
 - c. Selecting replacements
 - d. Identifying the most profitable cows in the herd
2. Which of the following is a characteristic of linear classification?
 - a. Measures traits of economic importance
 - b. Indicates poor and ideal characteristics
 - c. Reduces herd profitability because of high classification cost
 - d. Measures functional traits on a scale of 1-10
3. A final type classification is developed using which measurement?
 - a. Linear measurement scores
 - b. Unified dairy score card
 - c. International Dairy Improvement score card
 - d. Missouri type classification scores
4. A minimum of _____ years is usually required to prove an A.I. sire.
 - a. 2
 - b. 4
 - c. 8
 - d. 10
5. Which of the following dairy sire selection indexes removes environmental differences?
 - a. Daughter-contemporary herd index
 - b. Herdmate comparison
 - c. Daughter-dam difference
 - d. Equal parent index

6. Using the daughter-dam difference index, what would be the sire index if the dam produced 18,000 lbs. of milk and the daughter produced 21,000 lbs. of milk?
- a. +3,000 lbs.
 - b. -3,000 lbs.
 - c. +6,000 lbs.
 - d. -6,000 lbs.
7. Estimated Average Transmitting Ability for a female is similar to a sire's _____.
- a. Equal parent index
 - b. Summary index
 - c. Predicted difference
 - d. Ancestry production index

Match the general area of linear evaluation on the right with the specific trait on the left.

- | | |
|-----------------------|------------------|
| 8. _____ Strength | a. Form |
| 9. _____ Size | b. Rump |
| 10. _____ Vulva angle | c. Feet and legs |
| 11. _____ Angularity | d. Udder |
| 12. _____ Support | e. Teats |
| 13. _____ Pasterns | |
| 14. _____ Balance | |
| 15. _____ Angle | |
| 16. _____ Rear height | |
| 17. _____ Width | |
18. List the four major areas evaluated in visual evaluation.
- a.
 - b.
 - c.
 - d.
19. List four sources of production records, other than individual, which are used to calculate a cow index.
- a.
 - b.
 - c.
 - d.

UNIT - ADVANCED DAIRY

Lesson 14: Reproductive Management

Objective: The student will design a reproductive management program.

Study Questions

1. What are the advantages and disadvantages of artificial insemination?
2. How can embryo transfer be used to improve the dairy herd?
3. How is heat detected in cows?
4. What reproductive health programs are used in dairy production?
5. What new developments in technology are beneficial to reproductive efficiency?

References

1. Advanced Dairy (Selected Readings). University of Missouri-Columbia: Instructional Materials Laboratory, 1987.
2. Gillespie, James R. Modern Livestock and Poultry Production, 2nd ed. Albany, NY: Delmar, 1983. Unit 40: Management of the Dairy Herd
3. Transparency Master
 - a) TM 14.1: Ultrasound Testing

UNIT - ADVANCED DAIRY

Lesson 14: Reproductive Management

TEACHING PROCEDURES

A. Review

Review the previous lesson.

B. Motivation

Failure of cows to conceive and calve on a 12- to 13-month interval can result in annual losses of milk and calf sales, increased dry cow feed cost, and added replacement and semen costs. Additional costs can result from the loss of genetically superior cows and possible genetic advancement because of failure to conceive.

C. Assignment

D. Supervised study

E. Discussion

1. Ask the students to identify benefits and drawbacks of using A.I.

What are the advantages and disadvantages of artificial insemination?

a) Advantages of A.I.

- 1) Increases the use of outstanding sires
- 2) Alleviates the danger and bother of keeping a bull
- 3) Makes it possible to overcome certain physical handicaps to mating
- 4) Lessens sire costs when using very valuable sires
- 5) Reduces the likelihood of costly delays from using infertile bulls
- 6) Helps control diseases such as leptospirosis
- 7) Makes it feasible to prove more sires
- 8) Creates large families of animals
- 9) Increases pride of ownership
- 10) Alleviates distance and time as limiting factors of mating
- 11) Increases profits

b) Disadvantages of A.I.

- 1) Cows must be checked for heat at least twice a day.
- 2) Special training and considerable practice is required to maintain insemination skills.
- 3) Added time and labor is necessary to breed the cow.
- 4) Special equipment and supplies are required if producers do their own insemination.

- 5) Caution must be used with semen storage.
 - (a) Maintain adequate level of liquid nitrogen in the storage tank.
 - (b) Tank damage can result if semen must be transported from farm to farm.
2. Ask the students to discuss how embryo transfer can upgrade the herd.

How can embryo transfer be used to improve the dairy herd?

- a) Several calves can be obtained from a valuable cow during a year's time.
 - b) The rate of progress in genetic improvement can be sped up within the herd.
 - c) Valuable cows that produce normal ova but fail to conceive due to some hormonal or anatomical defects do not need to be culled because of sterility.
 - d) Heifers can be effectively progeny tested at an early age, reducing generation length by a year or more.
 - e) Genetically inferior cows can be made more productive by using them as incubators.
3. Have the students list the characteristics of a cow in heat.

How is heat detected in cows?

- a) Symptoms exhibited by cow
 - 1) Attempts to mount other cows
 - 2) Restlessness, bawling, excessive walking, drop in feed intake and decrease in milk production
 - 3) Swelling and reddening of the vulva
 - 4) Pale white or opaque mucus discharge from the vulva
 - 5) Stands still when mounted by other cows (standing heat)
 - 6) Thin stream of clear mucus discharge when cow is in heat
 - 7) Bloody discharge from the vulva when heat period is over
 - b) Commercial markers
 - 1) KaMaR^R patch: releases a red dye when pressure is applied from a mounting cow
 - 2) Chin-ball marker: device on one of the following animals leaves a dye on the cow in heat when mounted
 - (a) Surgically altered bulls
 - (b) Spayed heifers
 - (c) Steers
 - (d) Estrogen-treated cows
4. Ask the students to identify reproductive health plans used in the dairy herd.

What reproductive health programs are used in dairy production?

- a) Vaccination to prevent reproductive diseases
 - 1) Brucellosis
 - 2) Leptospirosis
 - 3) Vibriosis
 - b) Palpation to determine the following
 - 1) Presence of infection in the reproductive tract
 - 2) Presence of cystic ovaries
 - 3) Occurrence of normal estrous
 - 4) Stage of pregnancy
5. Ask the students to list recent advancements which may benefit reproductive productivity. Show TM 14.1.

What new developments in technology are beneficial to reproductive efficiency?

- a) Ultrasound
 - 1) Accurate pregnancy detection as early as 30 days
 - 2) Aids in culling
 - 3) Easy to recheck cows
 - 4) Helps spot problems
 - (a) Infections
 - (b) Cystic ovaries
 - (c) Postpartum abnormalities
- b) Milk progesterone testing
 - 1) Verifies heat
 - 2) An aid in diagnosing pregnancy
 - 3) Monitors heat cycle after calving
 - 4) Screens for ovarian dysfunctions
 - (a) Cystic follicles
 - (b) Luteinized follicles
- c) Sexing embryos
 - 1) Calf's sex can be determined before placing the embryo in the recipient.
 - 2) Producers can market unborn offspring by guaranteeing the gender.
- d) Prostaglandins
 - 1) Aid in getting heifers to freshen at 24 months of age
 - 2) Can be used on cows known to have silent heats so they can be rebred
 - 3) Synchronize heifers so they all breed and calve at the same time

F. Other activities

- 1. Plan a field trip to view semen collection at an A.I. facility or on the farm.
- 2. Invite an A.I. company to set up a demonstration using actual reproductive tracts of cows and heifers.

3. Invite a local veterinarian to outline for the class a recommended reproductive management plan for the area.

G. Conclusion

In the future, producers may call the inseminator to implant an embryo just as commonly as they now call for A.I. service. Although new technology such as embryo transfer and embryo sexing may greatly improve reproductive efficiency, basic problems such as detecting heat can render the new technology ineffective. A sound reproductive health program can save the producer hundreds of dollars per year in lost production and added feed cost. Scientists are continually developing new products to increase efficiency. Innovative and forward-thinking producers use this technology as a tool to increase the productivity of their dairy enterprises.

H. Competency

Describe reproductive technology for dairy.

I. Answers to Evaluation

1. a
2. d
3. c
4. b
5. b
6. Any five of the following:
 - a) Increases the use of outstanding sires
 - b) Alleviates the danger and bother of keeping a bull
 - c) Makes it possible to overcome certain physical handicaps to mating
 - d) Lessens sire costs when using very valuable sires
 - e) Reduces the likelihood of costly delays from using infertile bulls
 - f) Helps control diseases such as leptospirosis
 - g) Makes it feasible to prove more sires
 - h) Creates large families of animals
 - i) Increases pride of ownership
 - j) Alleviates distance and time as limiting factors of mating
 - k) Increases profits

UNIT - ADVANCED DAIRY

Name _____

Date _____

Lesson 14: Reproductive Management

EVALUATION

Circle the letter that corresponds to the best answer.

1. A reproductive disease which can be prevented by vaccination is _____.
 - a. Vibriosis
 - b. Ketosis
 - c. Anaplasmosis
 - d. Tuberculosis
2. An advantage of using ultrasound is _____.
 - a. Can determine sex of embryo
 - b. Can detect cows in heat
 - c. Used to detect pregnancy at 14 days after breeding
 - d. Helps spot cystic ovaries
3. Identify the advantage of using prostaglandins.
 - a. Used to detect silent heat
 - b. Used to detect infection in the reproductive tract
 - c. Aids in getting groups of heifers or cows to calve at the same time
 - d. Causes cow to produce several ova at one time
4. Which is not an advantage of embryo transfer?
 - a. Genetic progress can be sped up.
 - b. Genetically superior cows are best used as "incubators."
 - c. Superior cows can produce several calves per year.
 - d. Heifers can be progeny tested at an early age.
5. Which of the following signs indicates that a cow is out of standing heat?
 - a. Opaque mucus discharge
 - b. Bloody discharge from the vulva
 - c. Bawling and excessive walking
 - d. Attempts to mount other cows

6. List five advantages of artificial insemination.

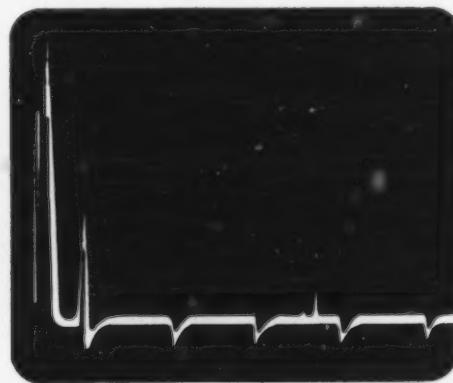
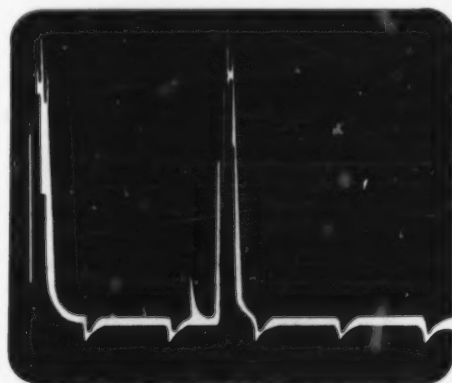
- a.
- b.
- c.
- d.
- e.

Ultrasound Testing



Typical pattern on the screen showing a pregnant cow

Typical pattern of an open cow



UNIT - ADVANCED DAIRY

Lesson 15: Facilities and Equipment

Objective: The student will plan the appropriate facilities and equipment for a dairy operation.

Study Questions

1. What types of housing are used in a dairy operation?
2. What are the advantages of using calf hutches as compared to a central barn?
3. What are advantages of the various milk parlor arrangements?
4. What feed handling systems are used in dairy?
5. What factors are considered for handling waste?
6. What equipment is used in handling dairy animals?

References

1. Gillespie, James R. Modern Livestock & Poultry Production, 2nd ed. Albany, NY: Delmar, 1983. Unit 43: Dairy Housing and Equipment
2. Advanced Dairy (Selected Readings). University of Missouri-Columbia: Instructional Materials Laboratory, 1987.
3. Dairy Housing and Equipment Handbook (MWPS-7), 4th ed. Ames: Midwest Plan Service, Iowa State University, 1985. (optional)
4. Transparency Masters
 - a) TM 15.1: Milking Parlor Designs
 - b) TM 15.2: Silage Storage Losses

UNIT - ADVANCED DAIRY

Lesson 15: Facilities and Equipment

TEACHING PROCEDURES

A. Review

Review the previous lesson.

B. Motivation

Just as business owners are concerned with the comfort and efficiency of their offices, so should dairy producers plan and provide a desirable place to work and a healthy and comfortable environment for their cows. Facilities should integrate feeding, milking and manure-handling operations to optimize labor efficiency in terms of cows handled per worker.

C. Assignment

D. Supervised study

E. Discussion

1. Ask the students to identify the different types of housing used in dairy.

What types of housing are used in a dairy operation?

a) For lactating cows

- 1) Stall barns: cow confined by stanchion, chain or strap around the neck
 - (a) Cows observed more frequently
 - (b) Higher labor requirements
 - (c) Popular in Europe
- 2) Group housing/sheds: cows rest in common bedded area
 - (a) Require less labor than stall barns
 - (b) Lowest cost per cow
 - (c) Require more bedding material
- 3) Free-stall housing: cows rest in individual open stalls
 - (a) Requires least amount of bedding
 - (b) Has least labor requirements
 - (c) Cows remain cleaner
 - (d) Less space necessary per cow

b) For dry cows

- 1) Sheds
 - (a) Provide adequate shelter for large numbers of animals
 - (b) May be easily cleaned with power equipment

- 2) Maternity quarters: an isolated stall for calving
 - (a) One stall recommended per 20 cows
 - (b) 100-120 sq. ft. recommended per stall
- c) For calves
 - 1) Warm barn: maintains warmer inside temperature than outdoor winter temperature
 - (a) Requires a ventilation system
 - (b) Provides a constant temperature for cattle
 - (c) Requires more facility investment
 - 2) Cold barn: allows temperature to vary with outside temperature
 - (a) Less expensive than warm barn
 - (b) Provides shelter from wind and rain
 - 3) Calf hutch: small structure for individual calves
 - (a) Requires more labor than for calves in barn
 - (b) Difficult to feed calves in bad weather
 - (c) May be difficult to find suitable hutch location
- d) Miscellaneous housing
 - 1) Hospital facilities: To isolate sick animals, a special barn should be constructed away from other buildings.
 - 2) Bull barn: Bulls are protected from rain and mud.
 - (a) Should allow for safe method of feeding
 - (b) Should be equipped with a chute to eliminate danger at breeding time
 - 3) Shades: For cattle without access to shade, open-sided structures should be provided.

2. Discuss with students the benefits of using calf hutches.

What are the advantages of using calf hutches as compared to a central barn?

- a) Hutches allow calves to adapt to natural environment soon after birth.
- b) Contamination and disease build-up can be avoided.
 - 1) Scrubbing
 - 2) Moving to clean ground
 - 3) Exposure to sunlight
- c) Results are comparable to those calves raised in environmentally controlled conditions.
- d) Hutches are relatively low in cost.
- e) They can be easily constructed.

3. Have the students describe the different milk parlor arrangements. Show TM 15.1.

What are advantages of the various milk parlor arrangements?

- a) Herringbone stalls
 - 1) Permit group handling of cows
 - 2) Reduced milker movements

- 3) Reduced cost of stall and parlor construction
 - 4) Readily accessible udders
 - b) Rotary parlor
 - 1) Parlors can handle large number of cows per hour.
 - 2) Buildings for parlors and holding pens can be smaller.
 - 3) Cow transfer lanes are simpler.
 - 4) Slow cows can circle the platform twice.
 - c) Side-opening stalls
 - 1) Cow can be cared for individually.
 - 2) More of the cow is visible.
 - 3) Slow milkers don't disrupt a group of cows.
 - d) Polygon parlor
 - 1) Improves cow traffic in and out of the parlor
 - 2) Includes automatic washer to clean and stimulate udder
 - 3) Automatically removes milker
 - e) Unilactor
 - 1) Uses various vacuum levels
 - 2) Reduces risk of udder injury from over-milking
 - f) Unicar
 - 1) Specially designed cars for lactating cows
 - 2) Space efficient
 - 3) Automatic feeding
 - 4) Easy collection of waste
 - 5) Allow for milking three or four times daily
4. Have the students identify different feed handling systems. Show TM 15.2.

What feed handling systems are used in dairy?

- a) Stall barn
 - 1) For small herds, push carts and hand unloading are the least costly.
 - 2) Overhead conveyors can deliver feed in barns or to outside bunks.
 - 3) Face-in stalls and wide alleys allow drive-through feeding with self-unloading wagons.
- b) Loose housing
 - 1) Feed is delivered to a bunk by mechanical conveyor or auger-mixer wagon.
 - 2) The system should be designed so that feeding matches production.
- c) Supplemental concentrate feeders
 - 1) These feeders are used where group feeding is not possible.
 - 2) The selective feeding system has individual feeding stalls.
 - 3) Each cow wears an identification device that triggers a feed dispenser as the cow approaches.
 - 4) A producer-programmed computer allocates a portion of the cow's daily concentrate.

- 5) Daily feed consumption data can be compiled for each cow.
 - d) Feed mixing systems
 - 1) Stationary mixer
 - (a) Best used with upright silos and storage bins
 - (b) May use conveyors or auger wagons to deliver feed to bunk
 - 2) Mobile mixer
 - (a) Feed storage location is less critical.
 - (b) Cows can be fed at remote sites.
 - (c) Mobility is time- and cost-efficient for herds of 100 cows or more.
 - e) Silage storage
 - 1) Upright silos: conventional with top unloaders; oxygen-limiting silos with bottom unloaders
 - (a) Conventional silos cost less per ton of dry matter stored.
 - (b) Spoilage losses in conventional silos can be high.
 - (c) Bottom-unloading silos offer the advantage of "feed first in, first out." With top-unloading silos, the last feed placed in the silo is the first fed.
 - 2) Horizontal silos: bunkers, trenches and free-standing stocks
 - (a) Where 1,200 tons or more of corn silage is fed per year, horizontal silos can be low cost.
 - (b) Proper management is essential to reduce storage losses.
 - (c) Silage should be covered with plastic to reduce loss.
 - f) Feed centers: design factors to consider
 - 1) Herd size
 - 2) Rations fed
 - 3) Proportions of forage crops harvested as corn silage, hay silage and hay
 - 4) Grain crops harvested and fed
 - 5) Purchased feeds
 - 6) Locations and condition of existing storage
 - 7) Type and size of storage needed
 - 8) Methods of unloading, storing, mixing feed components and delivering rations
 - 9) Future expansion
5. Have the students list the considerations when handling animal waste.

What factors are considered for handling waste?

- a) Volume of effluent from milking and cleaning operation
 - 1) Diluted liquid manure with feed, bedding and hoof dirt
 - 2) Diluted milk and cleaners from equipment washing

- 3) Concentrated milk products: colostrum, medicated or spilled milk
- 4) Clean water from final pipeline rinse and water-cooled condenser
- b) Volume of manure
 - 1) Mature cattle produce 6-8% of their body weight in manure each day.
 - 2) Fresh manure, a mixture of urine and feces, is about 12% solids.
- c) Volume and type of bedding
 - 1) Bedded housing usually requires that manure be handled as a solid.
 - 2) Wooden materials, such as sawdust, are satisfactory bedding and cause few liquid manure handling problems.
- d) Type of collection systems
 - 1) Slatted floors
 - (a) Suitable for animals of all ages
 - (b) Require less labor
 - 2) Scrapers and blades
 - (a) Fewer odors are present because of frequent manure removal.
 - (b) Mechanical scrapers reduce labor requirements,
 - (c) Corrosion and deterioration of equipment can be a problem.
 - (d) A small tractor with blade can be more dependable during cold weather.
 - 3) Front-end loaders
 - (a) These loaders are usually limited to straight runs and areas with few turns.
 - (b) Skid-steer loaders work more easily in tight quarters.
 - 4) Flushing systems
 - (a) Large volumes of water flow down a sloped alley, carrying manure to an outside storage.
 - (b) Adequate cleaning requires 100 gallons of water daily per 1,000 lbs. of live animal weight.
 - (c) Performance can be reduced when outside temperatures stay below 20-25F.
 - 5) Gravity-flow channel
 - (a) Manure flows naturally down the inclined surface, so no mechanical equipment is needed.
 - (b) Gravity-flow channels can be used with slatted floors.
 - (c) Biological activity helps to liquify the manure and maintain a constant flow.
- e) Types of liquid manure storage
 - 1) Below-ground storage
 - (a) Stored in below-ground tanks
 - (b) Tanks designed to withstand all anticipated earth, hydrostatic and live loads.
 - 2) Earth-storage basins
 - (a) Long-term storage with moderate investment

- (b) Constructed to prevent ground and surface water contamination
 - 3) Above-ground storage
 - (a) Expensive, as compared to earth basins
 - (b) Provides an alternative where basins are limited
 - f) Planning for solid manure storage
 - 1) Provide convenient access for filling and unloading.
 - 2) Locate storage for year-round access.
 - 3) Design for adequate capacity.
 - (a) Number and size of animals
 - (b) Type and amount of bedding
 - (c) Desired storage period
 - g) Solid manure handling systems
 - 1) Spreader mechanisms include paddles, flails and augers.
 - 2) Mechanisms should spread manure uniformly.
 - h) Liquid manure handling systems
 - 1) Liquids: up to 4% solids
 - (a) Irrigation systems
 - (b) Sprayer on tank wagon
 - 2) Slurries: 4-15% solids
 - (a) Must be agitated before pumping
 - (b) Require high pressure to pump long distances
6. Ask the students to describe equipment used to handle dairy animals.

What equipment is used in handling dairy animals?

NOTE: Handling equipment requirements vary greatly from farm to farm, depending on number of animals, frequency of handling and cost of equipment.

- a) A squeeze chute and head gate restrict animal movement during vaccination and veterinary exams.
- b) Loading chute needs depend on the method of transporting livestock.

F. Other activities

- 1. Plan field trips that include visits to dairy operations which incorporate different housing and parlor systems. Have the students analyze the systems and then develop an appropriate system, given a certain set of resources.
- 2. Have the students estimate the cost of constructing new dairy facilities by gathering information from local contractors, area extension specialists and producers who have recently constructed facilities. How would these costs affect a new producer just getting started?

G. Conclusion

There are a wide variety of dairy facilities to fit a wide range of needs and resources--from a simple stanchion barn to the high-tech Unicar milking system, from a pitchfork and manure spreader to flush tanks and irrigated lagoons. Thousands of dollars can be spent in building the simplest dairy facility. Before dollars and time are spent on the facilities and equipment for daily use, careful planning should take place in the form of needs assessment and resource lists.

H. Competency

Analyze the farm situation and select the appropriate facilities and equipment for milk production.

I. Answers to Evaluation

1. c
2. b
3. d
4. a
5. c
6. c
7. d
8. b
9. d
10. c
11. a
12. e
13. b
14. d
15. e
16. a
17. c
18. a
19. Any two of the following:
 - a) Scrubbing
 - b) Moving to clean ground
 - c) Exposing to sunlight
20. Any two of the following:
 - a) Number of animals owned
 - b) Frequency of handling
 - c) Cost of equipment

Name _____

UNIT - ADVANCED DAIRY

Date _____

Lesson 15: Facilities and Equipment

EVALUATION

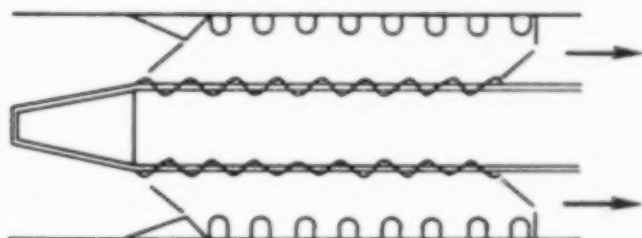
1. Which of the following housing systems is used more in Europe than in the U.S.?
 - a. Free-stall barns
 - b. Group housing
 - c. Tie-stall barns
 - d. None of the above
2. Which of the following is not an advantage of using calf hutches?
 - a. Relatively low cost
 - b. Less labor is required to care for calves
 - c. Can be easily constructed
 - d. Allow calves to adapt to natural environment
3. Which of the following characteristics best fits a stationary mixing system?
 - a. Feed storage location less critical
 - b. Cost efficient for herds of 100 cows or more
 - c. Cows can be fed at remote sites
 - d. Use fits upright silos and storage bins
4. Which of the following silage storage systems has the advantage of "first material in, first fed?"
 - a. Oxygen-limiting
 - b. Conventional
 - c. Trench
 - d. Free standing
5. A 1,000-pound cow will produce approximately how many pounds of manure each day?
 - a. 20-25
 - b. 40-50
 - c. 60-80
 - d. 85-100

6. Which manure collection system is usually affected by temperatures below 20-25F?
- a. Slatted floors
 - b. Tractor with scraper blade
 - c. Flushing systems
 - d. None of the above
7. Which of the following should be considered when planning a feed center?
- a. Grain crops harvested and fed
 - b. Herd size
 - c. Location and condition of existing storage
 - d. All of the above
8. Manure slurries are usually what percent solids?
- a. 1-3
 - b. 4-15
 - c. 25-40
 - d. 50 or more
9. Which of the following is a characteristic of free-stall housing?
- a. Free-stall has the lowest housing cost per cow.
 - b. Cows tend to be dirtier.
 - c. Cows are observed more often than in other systems.
 - d. Less space is required per cow.
10. Which of the following is characteristic of supplemental concentrate feeders?
- a. Feeders are most effective in operations which cannot divide the cows into feeding groups.
 - b. Conveyors deliver feed to outside bunks.
 - c. Daily feed consumption data can be printed out for each cow.
 - d. Cows are fed in small groups of 5-10.
11. Which of the following miscellaneous housing systems is more important in a dry-lot operation than in an operation where cattle are on pasture?
- a. Shades
 - b. Bull barns
 - c. Hospital area
 - d. Cattle working area

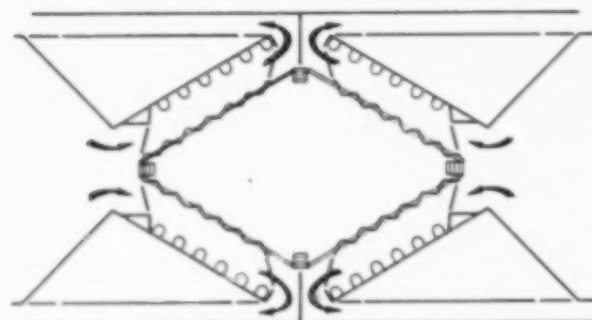
Match the parlor system on the right with the definition on the left.

- | | | |
|-----------|---|-------------------|
| 12. ___ | Allows for easy collection of waste | a. Herringbone |
| 13. ___ | Doesn't allow slow milkers to disrupt the group | b. Side-opening |
| 14. ___ | Improves cow traffic in and out of the parlor | c. Rotary |
| 15. ___ | Allows cows to be milked three or four times daily | d. Polygon |
| 16. ___ | Lower stall and parlor construction cost | e. Unicar |
| 17. ___ | Enables milker to handle large numbers of cows per hour | |
| 18. ___ | Reduces milker's movements | |
19. List two reasons that disease build-up is less when using calf hutches.
- a.
- b.
20. List two factors that affect dairy handling equipment requirements.
- a.
- b.

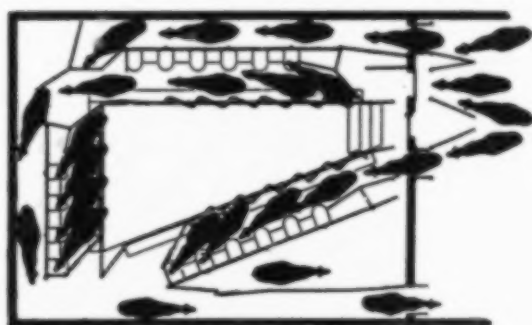
Milking Parlor Designs



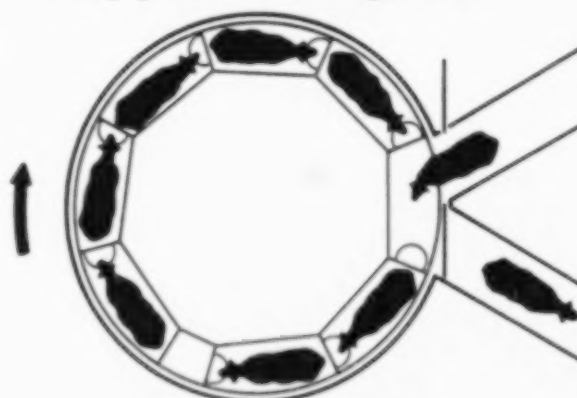
Double-8 Herringbone



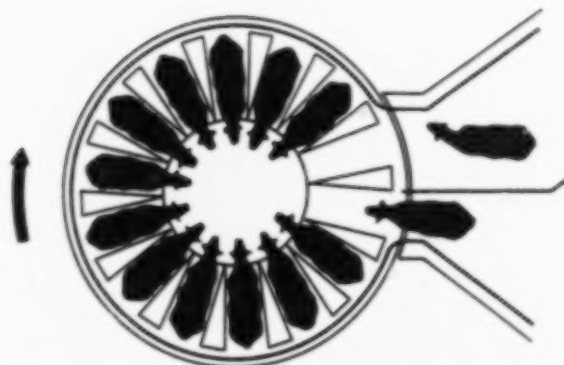
Polygon Herringbone



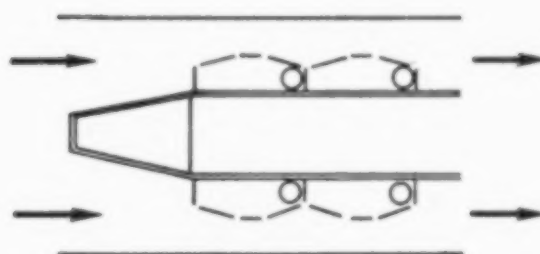
Trigon



Rotary Tandem



Turnstyle

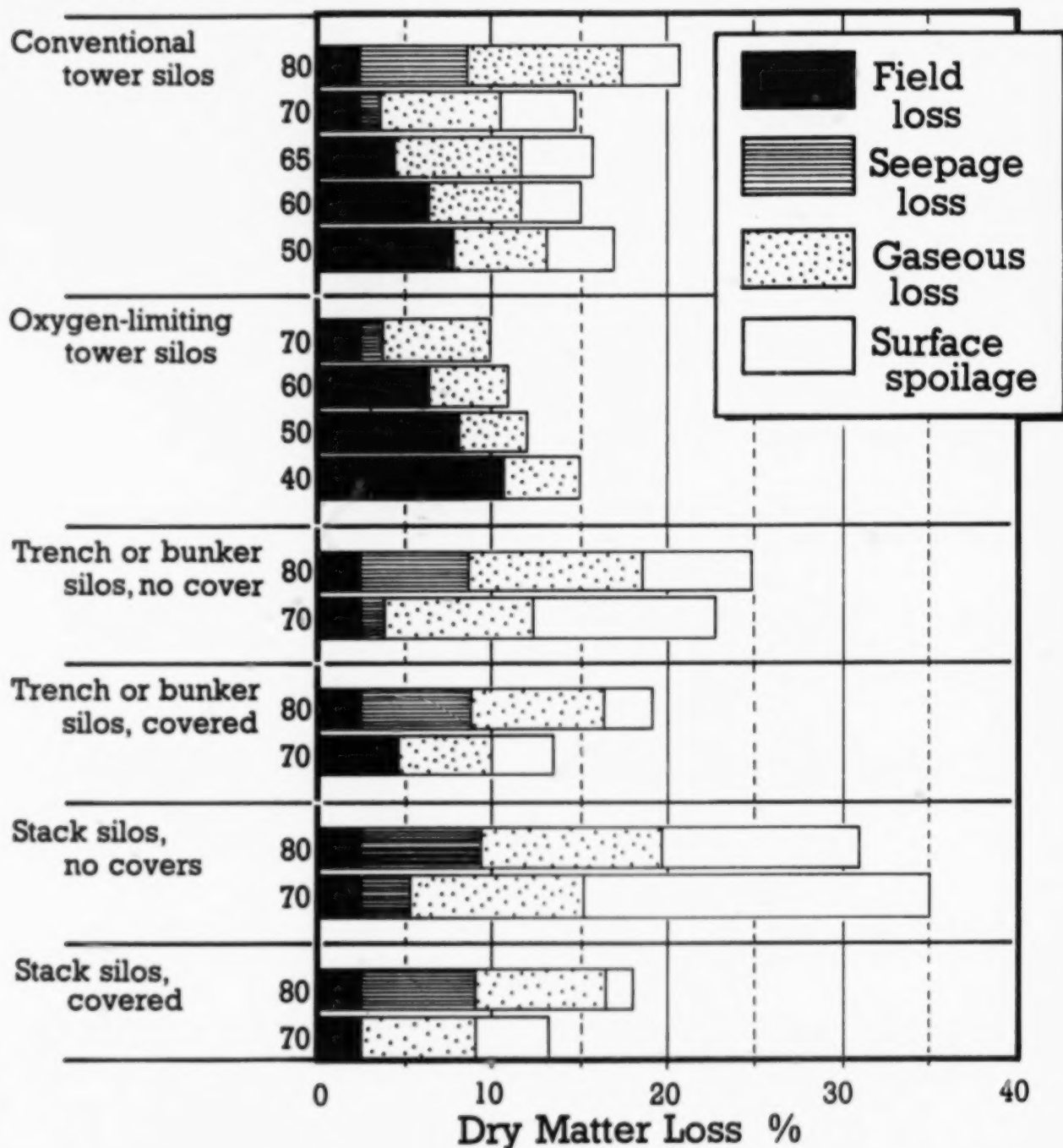


Double-2, Side Opening

Credit: Adapted from extension publications from Michigan State University, Western Regional Extension Publications and the University of Arizona.

Silage Storage Losses

Silo Type / Moisture %



Credit: Adapted from Forages, 3rd ed. Ames: Iowa State University Press, 1973.

UNIT - ADVANCED DAIRY

Lesson 16: Dairy Herd Health Programs

Objective: The student will design a herd health program.

Study Questions

1. What are the four major categories of diseases that affect dairy herds?
2. What are the recommended vaccination programs used with dairy animals?
3. What precautionary steps help prevent and control mastitis?
4. What dairy diseases are controlled by a good nutrition program?
5. What diseases in the dairy herd can infect humans?

References

1. Gillespie, James R. Modern Livestock and Poultry Production, 2nd ed. Albany, NY: Delmar, 1983. Unit 15: Diseases and Parasites of Beef Cattle and Unit 42: Dairy Herd Health
2. Advanced Dairy (Selected Readings). University of Missouri-Columbia: Instructional Materials Laboratory, 1987.

UNIT - ADVANCED DAIRY

Lesson 16: Dairy Herd Health Programs

TEACHING PROCEDURES

A. Review

Review Lesson 14: Reproductive Management in preparation for this lesson.

B. Motivation

Without disease control, progress through breeding and selection is hampered, and the goal of efficiency in feeding and management is hopeless. "Healthy cows are not necessarily productive ones, but productive cows are necessarily healthy ones."

--Campbell and Marshall, The Science of Producing Milk for Man, 1975

C. Assignment

D. Supervised study

E. Discussion

1. Ask the students to list the four major categories of diseases affecting the dairy herd.

What are the four major categories of diseases that affect dairy herds?

- a) Metabolic
 - 1) Milk fever (parturient paresis)
 - 2) Ketosis
 - 3) Grass tetany
- b) Reproductive
 - 1) Brucellosis
 - 2) Leptospirosis
 - 3) Trichomoniasis
 - 4) Vibriosis
 - 5) Metritis
- c) Parasitic
 - 1) Intestinal roundworms
 - 2) Lungworms
 - 3) Coccidiosis
 - 4) Liver flukes
 - 5) Grubs
 - 6) Lice
- d) Infectious
 - 1) Mastitis

- 2) Bovine Virus Diarrhea (BVD)
- 3) Foot rot
- 4) Infectious Bovine Rhinotracheitis (IBR, rednose)
- 5) Para-Influenza-3 (PI-3)
- 6) Anaplasmosis
- 7) Blackleg
- 8) Pinkeye
- 9) Warts

2. Ask the students to list the diseases that should be vaccinated for in a herd health program.

What are the recommended vaccination programs used with dairy animals?

- a) Brucellosis: required by state law at 4-11 months
- b) Blackleg: 2-3 months and again at 5-6 months
- c) IBR and PI-3: four months, repeat at 12 months
- d) BVD: can be given with IBR at four months and also 8-12 months
- e) Leptospirosis: 30 days postpartum
- f) Vibriosis: combine with leptospirosis for herds using natural mating

3. Have the students list preventive measures for mastitis control.

What precautionary steps help prevent and control mastitis?

- a) Milk all diseased cows last.
- b) Use a strip cup before milking.
- c) Wash udders with clean, individual towels soaked in a chlorine solution.
- d) Wash and dry hands before milking.
- e) Remove teat cups immediately when milk flow stops.
- f) Dip teats in a chlorine solution after milking.
- g) Periodically check rubber parts and vacuum of milking machine.
- h) Keep facilities and equipment sanitary at all times.
- i) Do not purchase mastitis-infected cows or replacements.

4. Lead the students in a discussion on the affects of good nutrition for disease control.

What dairy diseases are controlled by a good nutrition program?

- a) Milk fever (parturient paresis)
 - 1) Feed low-calcium, high-phosphorus rations during the dry period.
 - 2) Provide high levels of Vitamin D just prior to calving.
 - 3) Feed normal to high levels of calcium after calving.

- b) Ketosis
 - 1) Prevent cows from becoming too fat during the dry period.
 - 2) Gradually increase grain intake after calving.
 - 3) Feed propylene glycol or sodium propionate where ketosis is a major problem.
 - c) Displaced abomasum
 - 1) Do not feed high concentrate rations and inadequate bulk.
 - 2) Provide at least half of the dry matter consumed as roughage.
 - (a) Hay
 - (b) Pasture
 - (c) Silage
 - d) Grass tetany
 - 1) Feed a supplement containing magnesium and calcium.
 - 2) Feed silage or hay and limit access to lush, fast-growing forage in the spring.
5. Ask the students to identify dairy herd diseases which can be transmitted to people.

What diseases in the dairy herd can infect humans?

- a) Anthrax
- b) Brucellosis (undulant fever in humans)
- c) Foot-and-mouth disease
- d) Leptospirosis
- e) Rabies
- f) Ringworm
- g) Tuberculosis
- h) Q fever

F. Other activities

Invite a local veterinarian to outline for the class an area herd health plan including: 1) vaccination, 2) nutrition and 3) mastitis and disease control. Then have students analyze the cost and value of these programs to the dairy operation.

G. Conclusion

Without doubt, one of the most serious threats to the dairy industry is poor animal health. Millions of dollars are lost each year due to reduced production, failures to produce at all, and death of livestock. Producers need to be well informed relative to the relationship of cattle diseases and parasites to animals--and to man, since many of them are transmittable between species. Luckily, preventive measures such as vaccination and proper feeding techniques can greatly reduce the incidence of disease in dairy herds.

H. Competency

Plan a herd health program.

I. Answers to Evaluation

1. d
2. a
3. b
4. b
5. c
6. c
7. b
8. d
9. c
10. d

11. Any five of the following:

- a) Milk all diseased cows last.
- b) Use a strip cup before milking.
- c) Wash udders with clean, individual towels soaked in a chlorine solution.
- d) Wash and dry hands before milking.
- e) Remove teat cups immediately when milk flow stops.
- f) Dip teats in a chlorine solution after milking.
- g) Periodically check rubber parts and vacuum of milking machine.
- h) Keep facilities and equipment sanitary at all times.
- i) Do not purchase mastitis-infected cows or replacements.

Name _____

Date _____

UNIT - ADVANCED DAIRY

Lesson 16: Dairy Herd Health Programs

EVALUATION

1. Which of the following is a metabolic disease?
 - a. Metritis
 - b. Bovine Virus Diarrhea
 - c. Leptospirosis
 - d. Ketosis
2. Vaccination is required by law for which of the following diseases?
 - a. Brucellosis
 - b. Anthrax
 - c. Foot-and-mouth disease
 - d. Coccidiosis
3. Which disease directly affects a cow's reproduction?
 - a. Mastitis
 - b. Vibriosis
 - c. Ketosis
 - d. Para-Influenza-3
4. Which of the following is an infectious disease?
 - a. Grass tetany
 - b. Foot rot
 - c. Coccidiosis
 - d. Udder edema
5. To prevent sudden death from the disease, which of the following vaccinations is given to calves under four months of age?
 - a. BVD
 - b. Calfhood
 - c. Blackleg
 - d. Trichomoniasis

6. Feeding extra Vitamin _____ before calving can help prevent milk fever.
- a. A
 - b. C
 - c. D
 - d. K
7. Displaced abomasum can be caused by which of the following?
- a. Feeding high roughage rations and inadequate concentrates
 - b. Feeding high concentrate rations and inadequate bulk
 - c. Feeding high calcium rations with inadequate phosphorus
 - d. Feeding high phosphorus rations with inadequate calcium
8. Deficiencies of which mineral causes grass tetany?
- a. Copper
 - b. Manganese
 - c. Zinc
 - d. Magnesium
9. Which of the following diseases causes undulant fever in humans?
- a. Q fever
 - b. Anthrax
 - c. Brucellosis
 - d. BVD
10. Which dairy disease cannot be contracted by humans?
- a. Foot-and-mouth disease
 - b. Tuberculosis
 - c. Rabies
 - d. Para-Influenza-3
11. List five precautionary steps which aid in controlling and preventing mastitis.
- a.
 - b.
 - c.
 - d.
 - e.

UNIT - ADVANCED DAIRY

Lesson 17: Feeding Dairy Animals

Objective: The student will evaluate feedstuffs and use the information to develop cost-effective, well-balanced dairy rations.

Study Questions

1. Why is a forage analysis needed?
2. What is the procedure for sampling forage?
3. How is a forage analysis interpreted?
4. How is the Pearson Square used in checking a ration?
5. What alternative feeds are used in ration balancing?
6. What is challenge feeding?
7. How do home-mixed and commercially mixed rations for dairy animals compare?

References

1. Gillespie, James R. Modern Livestock and Poultry Production, 2nd ed. Albany, NY: Delmar, 1983. Unit 7: Balancing Rations and Unit 39: Feeding Dairy Cattle
2. Advanced Dairy (Selected Readings). University of Missouri-Columbia: Instructional Materials Laboratory, 1987.
3. Handout
 - a) HO 17.1: Analysis Information Sheet
4. Belyea, Ronald; Barry J. Steevens. "Formulating Dairy Rations with Alternative Feeds." University of Missouri-Columbia: Dairy Science Department, 1986. (optional)
5. Ricketts, Rex; Barry J. Steevens. "By-product Feed Prices." University of Missouri-Columbia: Agricultural Economics and Dairy Science departments, 1987. (optional)

UNIT - ADVANCED DAIRY

Lesson 17: Feeding Dairy Animals

TEACHING PROCEDURES

A. Review

Review the previous lesson.

B. Motivation

Feed costs represent 40-50% of the total cost of producing milk. Feeding the correct amount of a balanced ration may reduce feed costs and/or increase production. The time spent improving the genetic ability of a cow to produce milk will not be realized if proper nutrition limits the individual's ability to produce to her potential.

C. Assignment

D. Supervised study

E. Discussion

1. Ask the students to explain why forage analysis is needed. HO 17.1 can be used during the next three questions as a sample analysis information sheet.

Why is a forage analysis needed?

- a) To determine the quality (nutrient concentration) of the forage
 - 1) Forage accounts for a minimum of one-third of the ration.
 - 2) Quality (fiber) determines forage intake, which will determine quantity and nutrient content of grains fed.
- b) To determine moisture content
 - 1) Important when selling and purchasing feeds, as producers do not want to pay for water
 - 2) Critical when balancing rations since water contains no nutrients

2. Ask the students to list the steps involved in taking a forage sample.

What is the procedure for sampling forage?

- a) Assemble needed equipment.
 - 1) Hay probe or forage sampler
 - (a) Tube with sharp cutting edge
 - (b) Can be turned by handbrake or electric drill

- 2) Plastic sample bags
 - 3) Pail
 - 4) Information sheets
 - b) For the forage crop to be sampled, observe the following.
 - 1) Select one analysis per type (species) of forage.
 - 2) The sample depends on several factors.
 - (a) Species of legume or grass
 - (b) Weed content
 - (c) Stage of maturity
 - (d) Rainfall/temperature
 - (e) Number of cuttings taken
 - c) Take the samples.
 - 1) Gather 12 subsamples per forage type.
 - 2) Mix sample in pail and take a subsample.
 - 3) Place subsample in the plastic bag.
 - 4) Number each bag.
 - d) Fill out the information card.
 - e) Record the sample number and type of feed for later reference.
 - f) Wrap and mail the sample.
 - g) Contact a county extension agent for information on where to send the sample for analysis or use the address on HO 17.1.
3. Lead the students in a discussion on how forage analysis is understood and utilized.

How is a forage analysis interpreted?

- a) Percent moisture: percentage of water in a feed sample on an "as fed" basis
- b) Percent dry matter (D.M.): Non-water percentage of the feed sample
 - 1)
$$D.M.\% = 100 \times \frac{\text{Sample wt. after drying}}{\text{Sample wt. before drying}}$$
 - 2)
$$D.M.\% = 100 - \% \text{ water}$$
- c) Percent crude protein (C.P.)
 - 1) Determination is based on the amount of nitrogen in the feedstuff.
 - 2) Crude protein contains compounds which are not true proteins.
 - (a) Amino acids
 - (b) NPN and ammonia
 - (c) Enzymes and vitamins
 - 3) Ruminants can make effective use of non-protein nitrogen to meet protein needs.
- d) Percent unavailable protein
 - 1) The protein that the cow cannot digest is measured as ADF-N or pepsin insoluble protein.
 - 2) ADF-N is usually less than 3% of dry matter or 10% of total nitrogen.
 - 3) Amounts greater than 3% indicate heat damage, in which available protein is reduced.

- e) Percent adjusted crude protein
 - 1) Protein after heat damage has been subtracted
 - 2) Equal to C.P. if not heat damaged
 - 3) Adjusted C.P. value used to formulate rations
- f) Percent acid detergent fiber (ADF)
 - 1) ADF gives a more accurate estimation of net energy than crude fiber because it is related to digestible fiber (cellulose and lignin) in forage.
 - 2) It is used to replace book values for forages since ADF varies greatly, depending on forage and stage of growth.
 - 3) Book values for grain can be used for ration formulation as they remain quite constant.
- g) Percent neutral detergent fiber (NDF): determined much the same way as ADF, except a different detergent is used under neutral conditions
 - 1) A ground forage sample is boiled.
 - 2) The liquid is passed through filter paper.
 - 3) Remaining residue is cell wall (total fiber).
 - (a) Hemicellulose
 - (b) Cellulose
 - (c) Lignin
 - 4) NDF can be used to predict forage intake.
- h) Net energy (N.E.): measure of energy available in the feed
 - 1) Maintenance of body functions: must be met before growth can occur
 - 2) Growth: energy needed for tissue and bone growth
 - 3) Lactation
 - (a) Energy necessary for milk production
 - (b) Maintenance and growth requirements met first
- i) Percent total digestible nutrients (TDN)
 - 1) Indicates the relative energy value of a feed to an animal
 - 2) Determined by adding digestible components
 - (a) Crude protein
 - (b) Crude fiber
 - (c) Nitrogen-free extract
 - (d) Crude fat
 - 3) Does not include digestible mineral matter

4. Have the students demonstrate how the Pearson Square can be used to check a dairy ration.

How is the Pearson Square used in checking a ration?

- a) Draw a square, dividing it from corner to corner diagonally into four equal parts, and write the percent crude protein needed in the center.
- b) Write the percent crude protein of the two feedstuffs at the left-hand corners of the square.
- c) Subtract the smaller number from the larger, working diagonally.

- 1) Write the difference at the opposite end of the diagonals.
 - 2) This represents the parts of feed needed from the horizontally corresponding feedstuff.
 - 3) The sum of the numbers on the right equals the difference in the numbers on the left. This can be used as a check for errors.
 - d) Divide the parts of each feed needed by the total parts to find the percent of each feed in the ration.
 - e) To determine exact pounds of feedstuffs needed, multiply the percent of feedstuff in the mix by the total pounds of mix.
 - f) To check the mix, use the following calculations.
 - 1) Multiply the pounds of feedstuffs by their percent protein.
 - 2) Add the pounds of protein together.
 - 3) Divide by the total weight of the mix to determine if C.P. is correct.
5. Ask the students to list alternative feeds which can be utilized in dairy rations.

What alternative feeds are used in ration balancing?

- a) Feed costs can be reduced when available by-products or alternative feeds are incorporated into the feeding program.
- b) Consider several factors when feeding alternative feeds.
 - 1) Lack of consistency in nutrient content because of different milling and processing procedures
 - 2) Palatability
 - 3) Possible toxicity or contamination with pesticides
 - 4) Effects upon digestion and utilization of the total ration
 - 5) Added labor requirements needed to handle by-product feeds
- c) There are a number of alternative or by-product feeds.
 - 1) Soybean hulls
 - 2) Dried distiller's grains
 - 3) Corn gluten feed
 - 4) Whole cottonseed
 - 5) Wheat middlings
 - 6) Hominy
 - 7) Dried brewer's grains
 - 8) Rice bran
 - 9) Wet brewer's grains
 - 10) Whey
 - 11) Beet pulp
 - 12) Alfalfa meal
 - 13) Molasses
 - 14) Wheat bran
 - 15) Potatoes

6. Have the students describe grain feeding during the prepartum and postpartum periods.

What is challenge feeding?

- a) Feeding higher levels of concentrate to challenge the cow to reach her maximum milk production potential
 - b) Feeding schedule
 - 1) Feed dry cows $\frac{1}{2}$ pound of concentrate per cwt.
 - 2) Increase to $1\frac{1}{2}$ pounds of concentrate per cwt at calving.
 - 3) Gradually increase to two pounds of concentrate per cwt at three weeks after calving.
 - 4) Continue gradual increase of concentrate until milk production levels off.
 - 5) When production drops, decrease concentrate one pound for each three pounds of milk production drop.
7. Have the students explain how home-mixed and commercially mixed dairy rations compare.

How do home-mixed and commercially mixed rations for dairy animals compare?

- a) Commercial feed manufacturers can offer several different types of feeds.
 - 1) Complete dairy concentrates
 - 2) Dry cow rations
 - 3) Growing or young stock rations
 - 4) Calf starters
 - 5) Milk replacer feeds
 - 6) Protein supplements
 - 7) Mineral and vitamin premixes
- b) The commercial feed manufacturer has other advantages.
 - 1) Purchasing feed in quantity lots at volume discounts
 - 2) Using computers for purchasing
 - 3) Having the facilities to manufacture specialty feeds
 - 4) Hiring scientifically trained personnel to determine rations
 - 5) Processing and mixing economy and control
- c) Home-mixed feeds have advantages, also.
 - 1) Using lower-cost, home-grown grains
 - 2) Eliminating the need for a profit margin (associated with commercial feeds)
 - 3) Allows producer to know exactly what is in the ration
- d) Home-mixed feeds cause the producer to make additional preparations.
 - 1) Cost of ingredients needed to balance the ration
 - 2) Cost of grinding and mixing
 - 3) Time and labor required for mixing feeds
 - 4) Cost of feed-handling facilities
 - 5) Knowledge required to balance the ration

- e) Commercial and home-mixed feed principles can be combined for best use of all resources.
 - 1) Many local feed mills will custom-mix feeds.
 - (a) Eliminates producers' need for bulk ingredient-handling facilities
 - (b) Frees producer to engage in other activities
 - 2) Producers can design their own feeding program.
 - (a) They have access to all ingredients used by the feed mill.
 - (b) Least costly ingredients can be chosen for ration formulation.
 - (c) Producers have exact knowledge of what goes into the ration.
 - 3) Custom rations can often be purchased at a lower cost than pre-mixed, manufactured rations of the same protein content.

F. Other activities

- 1. During a field trip to a local dairy, demonstrate to the students how to take concentrated, fresh and stored forage samples in preparation for analysis.
- 2. Have students contact laboratories such as those listed in the selected readings to determine the type of analysis they provide and the cost of the tests. Encourage students with home-raised forages to submit a forage sample for testing. Analysis reports can be used to demonstrate how forage analysis is interpreted.
- 3. Students could contact local feed dealers to determine what alternative feeds are available in the area, their cost and usefulness in a dairy ration.

G. Conclusion

Forages can provide a relatively cheap source of protein in a dairy ration. However, to accurately balance a complete ration for all types of dairy stock, it is important to know the exact feeding value of the forages used in the ration. Laboratories in the area provide forage analysis at a modest fee. With this information, the producer can balance rations using standard concentrates, supplementing with alternative feeds when feasible. Challenge feeding is one example of the several methods available which can be used to feed individuals. Regardless of the feeding method, providing a blended, well-balanced ration is vital for top milk production. Depending on resources such as time, labor and capital, the producer can decide whether to custom-mix feed or to purchase it pre-mixed.

H. Competency

Evaluate feedstuffs for the most profitable balanced ration.

I. Answers to Evaluation

- | | | | |
|----|---|-----|---------|
| 1. | c | 8. | d |
| 2. | b | 9. | d |
| 3. | d | 10. | d |
| 4. | d | 11. | d |
| 5. | c | 12. | a |
| 6. | b | 13. | b |
| 7. | a | 14. | b, a, c |
15. Any five of the following:
- a) Soybean hulls
 - b) Dried distiller's grains
 - c) Corn gluten feed
 - d) Whole cottonseed
 - e) Wheat middlings
 - f) Hominy
 - g) Dried brewer's grains
 - h) Rice bran
 - i) Wet brewer's grains
 - j) Whey
 - k) Beet pulp
 - l) Alfalfa meal
 - m) Molasses
 - n) Wheat bran
 - o) Potatoes
16. Any four of the following:
- a) Species of legume or grass
 - b) Weed content
 - c) Stage of maturity
 - d) Rainfall
 - e) Number of cuttings taken
17. a) Important when selling and purchasing feeds, as producers do not want to pay for water
- b) Critical when balancing rations since water contains no nutrients

Name _____

UNIT - ADVANCED DAIRY

Date _____

Lesson 17: Feeding Dairy Animals

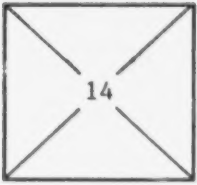
EVALUATION

Circle the letter that corresponds to the best answer.

1. What is the amount of dry matter in a forage sample if the sample weight after drying is 12 ounces and the sample weight before drying is 16 ounces?
 - a. 25%
 - b. 50%
 - c. 75%
 - d. 85%
2. Percent crude protein is found by determining the amount of _____ in the feedstuff.
 - a. Amino acids
 - b. Nitrogen
 - c. Potassium
 - d. Enzymes
3. Which of the following can cause a large percent of available protein to be tied up?
 - a. Rain on cured hay
 - b. Adding salt to the forage
 - c. Harvesting the forage after November
 - d. Heating of the forage
4. Which of the following is not used to determine TDN?
 - a. Crude fiber
 - b. Crude protein
 - c. Nitrogen-free extract
 - d. Mineral matter

5. Which factor is the best reason for using alternative feeds?
- Increased ration palatability
 - Reduced feed handling requirements
 - Reduced feed cost
 - Increased utilization of the total ration
6. Which is the most correct definition of challenge feeding?
- Increasing the amount of concentrates fed throughout the lactation to maintain high milk production
 - Increasing the amount of concentrates in early lactation and decreasing when milk production begins to decline
 - Increasing consumption of concentrates through feeding with other cows so cows are forced to compete for feed
 - Increasing the amount of forage fed throughout the lactation to maintain high levels of milk production
7. What is usually the best reason to use home-mixed feeds?
- Utilize home-grown grain
 - Allow producer to know exact composition of ration
 - Eliminate need for profit margin on feed
 - Use computer to purchase cheap feed
8. Which of the following is a good reason for the producer to design a ration and have it custom mixed?
- Producer's need for bulk ingredient-handling facilities is eliminated.
 - Producer can use feedstuffs carried by mill.
 - Custom mixes are often cheaper than commercial premixes.
 - All of the above
9. What should be considered by a producer considering a home-mixed feed system?
- Cost of grinding and mixing
 - Cost of premixes or supplements
 - Knowledge of ration balancing
 - All of the above

To calculate answers to the next three questions, use the following Pearson Square sample.

grain mix	10		30		$30/34 = 88$
					
supplement	44		<u>4</u> 34		$4/34 = 12$

10. What percent of the above ration is grain?
 - a. 10
 - b. 14
 - c. 30
 - d. 88
11. What percent C.P. is this ration?
 - a. 4
 - b. 10
 - c. 12
 - d. 14
 - e. 30
12. How many parts of supplement are in this ration?
 - a. 4
 - b. 12
 - c. 34
 - d. 44
13. Forages usually account for at least _____ of the ration.
 - a. one-fourth
 - b. one-third
 - c. one-half
 - d. two-thirds
14. Rank the following processes in order of energy use.

___	a.	growth
___	b.	maintenance
___	c.	lactation

15. List five by-product or alternative feedstuffs.
 - a.
 - b.
 - c.
 - d.
 - e.
16. List four of the five explanations for the differences between forage samples.
 - a.
 - b.
 - c.
 - d.
17. List two reasons why the determination of moisture content is important.
 - a.
 - b.

Analysis Information Sheet

LIVESTOCK NUTRITION LABORATORY SERVICES

A DIVISION OF
MISSOURI DAIRY HERD IMPROVEMENT FEDERATION

Phone: (314) 445-4476

P.O. Box 1655

Columbia, Missouri 65205

February 1, 1987

The Profit Edge
DHI

GROWER Name _____ Address _____ Phone Number _____ Bill: Grower _____ Submitter _____ Copy to: Grower _____ Submitter _____	SUBMITTED BY Name _____ Address _____ Phone Number _____ Payment Enclosed _____ Other _____ Date Sent _____
SAMPLE DESCRIPTION 1. Kind of sample: _____ 2. Cutting 1st 2nd 3rd _____ 3. Livestock to be fed: _____ 4. County: _____	
MO DHI Herd Code # _____ Supervisor Name _____	

MO DHI Dairymen Deduct \$4.00 from list price for any of the 1st 6 tests.

		Cash	Credit
_____ Test 1	Moisture, Crude Protein, Adjusted Crude Protein, Available Protein, ADF-N, Acid Detergent Fiber, Neutral Detergent Fiber, TDN, Net Energy Lactation, Net Energy Gain, Net Energy Maintenance, Calcium, Phosphorus, Magnesium, Potassium, Sodium, Sulfur, Iron, Copper, Manganese, Zinc, Qualitative Nitrate	\$30.00	\$34.00
_____ Test 2	*Hay Test - Moisture, Crude Protein, Adjusted Crude Protein, Available Protein, ADF-N, Acid Detergent Fiber, Neutral Detergent Fiber, TDN, Net Energy Lactation, Net Energy Gain, Net Energy Maintenance, Calcium, Phosphorus, Qualitative Nitrate	\$25.00	\$28.00
_____ Test 3	Moisture, Crude Protein, Acid Detergent Fiber, TDN, Net Energy Lactation, Net Energy Gain, Net Energy Maintenance, Calcium, Phosphorus, Qualitative Nitrate ..	\$20.00	\$22.50
_____ Test 4	Moisture, Crude Protein, Acid Detergent Fiber, TDN, Net Energy Lactation, Net Energy Gain, Net Energy Maintenance, Qualitative Nitrate	\$17.00	\$19.00
_____ Test 5	Moisture, Crude Protein, Calcium, Phosphorus, Magnesium, Qualitative Nitrate ...	\$17.00	\$19.00
_____ Test 6	Moisture, Crude Protein, Qualitative Nitrate	\$15.00	\$17.00
_____ Test 7	Available Protein and Adjusted Crude Protein if Desired with Test 2, 3, or 4	\$ 4.25	\$ 5.00
_____ Test 8	Neutral Detergent Fiber or Acid Detergent Fiber	\$ 4.00	\$ 4.50
_____ Test 9	Ash	\$ 3.50	\$ 4.00
_____ Test 10	Blacklight Scan (indicates presence of Mycotoxins in Grains only)	\$ 3.50	\$ 4.00
_____ Test 11	Fat	\$ 8.00	\$ 9.50
_____ Test 12	Quantitative Nitrate	\$ 8.00	\$ 9.50
_____ Test 13	Salt	\$ 6.00	\$ 7.00
_____ Test 14	Sulfur if Desired with Test 2, 3, or 5	\$ 3.50	\$ 4.00
_____ Test 15	Urea	\$10.00	\$12.00
_____ Test 16	PH	\$ 3.50	\$ 4.00
_____ Test 17	Water Analysis: Calcium, Magnesium, Sodium, Sulfur, Iron, Quantitative Nitrate, Water Hardness	\$15.00	\$17.25
_____ Test 18	Manure Analysis: Nitrogen, Phosphorus, Potassium	\$14.50	\$16.75
_____ Test 19	Tall Fescue Fungus Analysis and Test Kit	\$23.00	\$25.00
_____ Test 20	Analysis Results by Phone	\$ 2.00	\$ 2.50

*Information Concerning Other Analysis or Combinations of Analyses Available Upon Request.

UNIT - ADVANCED DAIRY

Lesson 18: Using Pasture and Roughage

Objective: The student will plan a forage program for profitable milk production on a dairy farm.

Study Questions

1. What forage alternatives need to be considered in a dry lot program?
2. How is pasture for dairy production selected?
3. What economic factors should be considered when buying roughage?
4. What forage equipment may be utilized in a dairy operation?

References

1. Advanced Dairy (Selected Readings). University of Missouri-Columbia: Instructional Materials Laboratory, 1987.
2. Barnes, Robert F.; Maurice E. Heath; Darrel S. Metcalfe; eds. Forages: The Science of Grassland Agriculture, 4th ed. Ames: Iowa State University Press, 1985. (optional)

UNIT - ADVANCED DAIRY

Lesson 18: Using Pasture and Roughage

TEACHING PROCEDURES

A. Review

Review the previous lesson.

B. Motivation

There are thousands of Missouri farmland acres that are best utilized by forage production. Ruminants like the dairy cow are best suited to harvest this forage. Forages can provide a high-quality feedstuff that may replace high-priced concentrates in a dairy ration. With careful management, forage production can be incorporated into the dairy enterprise to make it more profitable.

C. Assignment

D. Supervised study

E. Discussion

1. Ask students to describe alternative forage systems for a dry lot enterprise.

What forage alternatives need to be considered in a dry lot program?

- a) Green chop: fresh herbage cut and chopped in the field for transportation to confined animals
 - 1) Considerations
 - (a) At least 100 lbs. of green chop is needed daily per lactating cow.
 - (b) A supply of hay or silage needs to be available in case of machinery failure.
 - (c) An analysis should be made of required time, machinery, investment and labor.
 - 2) Favorable factors to green chop usage
 - (a) Increases land carrying capacity 30-50%
 - (b) More practical to use distant, small and scattered pastures
 - (c) Less refused and wasted forage
 - (d) Alleviates need for fencing, water and shade in pastures
 - 3) Factors unfavorable to green chop
 - (a) Higher harvesting cost
 - (b) Quantity and quality variations
 - (c) Mechanically spread manure

- (d) Chance of bloat and toxicity
- b) Silage: fermented forage
 - 1) Advantages
 - (a) Retains a higher proportion of plant nutrients than does hay
 - (b) Produces the maximum quantity of feed per acre
 - (c) Feasible to produce a top-quality feed during bad weather
 - (d) Requires less storage space than hay
 - (e) Helps control weeds
 - (f) Cheapest form of succulent winter feed
 - (g) Very palatable
 - (h) Little or no bloat
 - 2) Disadvantages
 - (a) Requires a silo and other special equipment for harvesting
 - (b) Has less Vitamin D than sun-cured hay
 - (c) Requires handling 2-3 times more tonnage than hay
 - (d) Lessens the amount of organic material returned to the soil
- c) Hay
 - 1) Benefits
 - (a) Used as supplement to high-moisture feeds to maintain proper microbial action in the rumen
 - (b) Lessens incidence of ketosis and displaced abomasum
 - (c) Prevents a lowering milkfat content in lactating cows
 - (d) Can be used to offset high concentrate prices
 - (e) Can be packaged to meet labor and handling resources
 - (f) Provides an important source of energy
 - 2) Shortcomings
 - (a) Hay varies in nutrient content and palatability.
 - (b) Nutritional needs of high producing cows cannot be met.
 - (c) Quality and feeding value can drop during rain curing, sun bleaching, handling when too dry and storing when too wet.
 - (d) A greater volume of plant material is lost during harvesting and feeding.
 - (e) Wet hay may generate enough heat to cause spontaneous combustion.
 - 3) Hay-making systems
 - (a) Long, loose hay
 - (b) Chopped hay
 - (c) Bales: conventional square and large round
 - (d) Stacks
 - (e) Cubes
 - (f) Pellets

2. Ask the students to outline criteria for choosing grazing areas for dairy cattle.

How is pasture for dairy production selected?

- a) Dairy cow performance
 - 1) Cows will produce at two-thirds of their maximum capacity when good-quality forage is the sole dietary ingredient.
 - 2) The low amount of energy available in forage often limits production.
 - 3) Rations containing 50% concentrates of dry matter will increase milk production about 50% over production obtained with forage alone.
- b) Forage constituents
 - 1) Energy
 - (a) The most important factor affecting energy is digestibility.
 - (b) The species type needs to be selected to match changing seasons to maintain the highest level of digestibility.
 - 2) Protein
 - (a) Protein is necessary for maintenance, growth and production.
 - (b) Forages having 18% C.P. or above should meet all needs of a high producing cow.
 - (c) Legumes are generally higher in protein than grasses.
 - 3) Minerals
 - (a) Cows producing more than 30 lbs. of milk daily need supplemental calcium and phosphorus.
 - (b) A deficiency of selenium is related to poor reproductive performance in dairy cattle and may be caused by low selenium uptake by plants.
 - (c) Magnesium deficiency causes grass tetany.
 - 4) Vitamins
 - (a) The most important source of vitamins A, D, E and K are green leafy forages.
 - (b) Care must be taken when feeding silage during the winter since vitamins A, D and E may become deficient.
- c) Legumes vs. grasses
 - 1) Legumes are generally higher in crude protein and plant cell solubles.
 - 2) Legumes also have the advantage of increased production.
 - 3) Legumes contribute nitrogen to the soil.
 - 4) Grasses have a good soil-holding ability and stand persistence.
 - 5) A combination of grasses and legumes often provides the best forage system.

- d) Impact of pastures on large herds
 - 1) Pasture consumption by dairy cows has dropped 50% since 1960 because high land values have forced large dairies to use their land resources more efficiently (dry lots).
 - 2) Costs associated with pastures include fencing, water supply and barn access.
 - 3) A uniform high yield is difficult to maintain on pasture.
 - e) Common forages grown in Missouri
 - 1) Grasses
 - (a) Bluegrass
 - (b) Tall fescue
 - (c) Orchardgrass
 - (d) Timothy
 - (e) Bromegrass
 - (f) Reed canarygrass
 - 2) Legumes
 - (a) Alfalfa
 - (b) Red clover
 - (c) White clover
 - (d) Lespedeza
 - (e) Birdsfoot trefoil
3. Lead the students in a discussion of financial considerations when purchasing roughages.

What economic factors should be considered when buying roughage?

- a) Quality
 - 1) Roughage quality affects the type, amount and protein content of other feeds needed to balance the ration.
 - 2) An analysis should be done on each load of purchased forage.
- b) Protein
 - 1) The value of a forage can be determined by comparison with a protein supplement such as soybean meal.
 - 2) Determine the value of one pound of protein.

$$\text{Protein cost (1 lb.)} = \frac{\text{Price of 100 lbs. of feed}}{\% \text{ protein of feed}}$$
 - 3) This analysis works best when feeds compared have similar nutritional values.
- c) Moisture
 - 1) Transporting water can become costly.
 - 2) A forage's feeding value should be determined on a dry matter basis.
 - 3) Rations need to be adjusted to an "as fed" basis to determine the actual pounds of forage to be fed.
- d) Availability
 - 1) Local ads or guides such as the Missouri Department of

Agriculture's Missouri Hay Directory help locate forage for sale.

- 2) The final cost of forages can be greatly increased due to transportation charges.
4. Ask the students to list forage equipment used in a dairy enterprise.

What forage equipment may be utilized in a dairy operation?

a) Hay systems

- 1) Tractor-drawn mower conditioner: cuts the forage and crushes the stem to allow for faster drying
- 2) Self-propelled swather: cuts forage, conditions it and forms the windrow
- 3) Tractor-drawn rake: used to turn the forage swath cut by the mower to reduce drying time
- 4) Conventional hay baler: used to form small square bales of hay
- 5) Automatic bale wagon: reduces labor requirements by loading small bales as they come from the baler
- 6) Large round baler: produces round bales of hay weighing 800-2,000 lbs.
- 7) Stack-forming wagons: hay compressed into large stacks designed to shed water; weigh up to 5.5 tons
- 8) Field cubers: designed to package forage into small, dense cubes that can be handled like grain. Forage must be 90% legume.
- 9) Tub grinders: used to convert hay into a ground product so it can be mixed with concentrates to form a free-flowing ration.

b) High-moisture forage systems

- 1) Field chopper: takes forage from standing crop or windrow, chops it into short lengths and blows it into a truck or wagon
- 2) Silage wagon: used to transport chopped silage from the field to the silo

F. Other activities

Invite the area dairy and/or forage extension specialist to outline the development of a forage system that will match expected performance for a given dairy operation.

G. Conclusion

The general trend within the dairy industry is toward a dry lot system with increased utilization of stored forages. Given land that is unsuitable for row crops and high costs of labor and equipment, many producers will continue to use some type of pasture system. Pastures can provide a large portion of a dairy cow's diet at a relatively low cost. Expenses rise when forages must be purchased since bulk increases

transportation costs. Concentrates used to balance the ration may need to be changed because of varying forage analysis. Forage equipment is a necessary part of most dairy operations, though the type and cost of equipment varies greatly. Equipment purchase can have a major impact on the cost of the forage system used in an operation.

H. Competency

Plan a pasture and roughage program for profitable milk production.

I. Answers to Evaluation

1. b
2. d
3. b
4. a
5. b
6. b
7. a
8. b
9. c
10. Any four of the following:
 - a) Bluegrass
 - b) Tall fescue
 - c) Orchardgrass
 - d) Timothy
 - e) Bromegrass
 - f) Reed canarygrass
11. Any three of the following:
 - a) Alfalfa
 - b) Red clover
 - c) White clover
 - d) Lespedeza
 - e) Birdsfoot trefoil

Lesson 18: Using Pasture and Roughage

EVALUATION

Circle the letter that corresponds to the best answer.

1. Which of the following is a disadvantage of using green chop?
 - a. Can feed a greater number of cattle from the same amount of land
 - b. Manure collected in one location
 - c. Less wasted forage
 - d. Makes use of distant fields
2. Identify the disadvantage of using silage.
 - a. Increases chance of bloat
 - b. Requires more storage space as compared to hay
 - c. Needs optimum weather to make
 - d. Has less Vitamin D than sun-cured hay
3. Which characteristic of hay is true?
 - a. Feeding hay increases the incidence of ketosis.
 - b. More plant material is lost during harvest than silage.
 - c. Hay intake causes milkfat to be reduced.
 - d. Hay is a poor substitute for high-priced concentrates.
4. Deficiencies of _____ are related to poor reproductive performance.
 - a. Selenium
 - b. Magnesium
 - c. Calcium
 - d. Phosphorus
5. If alfalfa hay costs \$100 per ton and tests 15% C.P., what would be the cost of one pound of protein?
 - a. 13¢
 - b. 33¢
 - c. 53¢
 - d. 73¢

6. When only quality forage makes up the diet, dairy cows will produce at what level of their maximum capacity?
 - a. one-half
 - b. two-thirds
 - c. three-fourths
 - d. 100%
7. Forages usually provide all calcium and phosphorus needed up to what daily level of production?
 - a. 30 lbs.
 - b. 40 lbs.
 - c. 60 lbs.
 - d. 80 lbs.
8. Which piece of equipment is associated with silage production?
 - a. Self-propelled swather
 - b. Field chopper
 - c. Tub grinder
 - d. Field cuber
9. To determine value, forages are most often compared to which high-protein feedstuff?
 - a. Corn
 - b. Wheat
 - c. Soybean meal
 - d. Whole cottonseed
10. List four common grasses used in forage production.
 - a.
 - b.
 - c.
 - d.
11. List three common legumes used in Missouri forage production.
 - a.
 - b.
 - c.